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PRACTICAL WINERY & VINEYARD (ISSN 9739-8077) is owned and published by PWV Incorporated. Published bi-monthly at subscription rate of $31/year. Outside the United States, please add $20US, sea mail; $22US, air mail. Postmaster: Please send change of address to 58-D Paul Drive, San Rafael, CA 94903. Back issues: $8 prepaid. News media may use no more than 1/4 page of material per issue provided that PRACTICAL WINERY & VINEYARD is credited.

PRACTICAL WINERY & VINEYARD

JANUARY/FEBRUARY 2007 • VOL. XXVIII, NO. 5

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Cover Photo: Scheid Vineyards winery (Greenfield, CA). Photo by Fred Lyon.

"To stimulate continuing improvement in the wine industry."

P&L Specialties' automated conveyance system delivers high-volume efficiency and gentle product handling. The conveyor construction formed the belt surface into a shallow U-shape that allows easy sorting of machine-harvested red grapes. The conveyor sorting surface is 36 inches wide and 24 feet long. For hand sorting, the belt can be slowed to 24 feet per minute (about 3 seconds per foot), and can be accessed on both sides by up to 14 sorters.

SCHEID VINEYARDS

BLENDING efficiency with quality

BY Tim Ryan, Axiom Engineers, Monterey, CA

One of the first things that visitors will notice in the Scheid Winery (Greenfield, CA) is the abundance of space and well-lit, efficient work areas. This was no accident, as the design team, consisting of Scheid personnel and design professionals from Axiom Engineers (Monterey and Napa, CA), working in conjunction with the Belli Architectural Group (Salinas, CA), were given this task at the first of many design meetings.

Kurt Gollnick, COO of Scheid Vineyards, explains Scheid's vision, which was to maintain and enhance quality without losing high production-rate capabilities. Scheid currently provides custom processing and juicing for 15

Automated belt delivery system, with variable speed drive, delivers grapes to any press door with a minimum of conveyors and labor required to operate the crush pad.

Mobile Diemme press leaves a fermentor after pressing to unload pomace at crush pad.

Large-volume receiving hopper has a custom-designed proprietary "low shear" progressive-pitch, 24-inch diameter screw with flight edging that minimizes maceration of grapes. The hopper is 8-feet wide, 20 feet long with 41 inches of depth (13 inches over standard) to provide the capacity to accommodate high receiving rates (up to 100 tons per hour). To maintain a required 36-inch grape truck dump height (the distance from ground to hopper lip), accommodate the additional 13 inches of depth, and provide 37-degree sloped hopper walls, the frame was custom-designed to allow the hopper to fit into a 12-inch recess in the concrete foundation by P&L Specialties.

customers. "This is a production winery in Monterey County," he notes, "not a ridge-top winery in Napa Valley planning to make money on wine-tasting events."

The design team translated this message to mean low-maceration grape handling whenever possible at an initial 100 tons per hour crush rate, for 12,000 tons per year production in the first-phase winery, with a goal of expansion to an ultimate capacity of 30,000 tons per year.

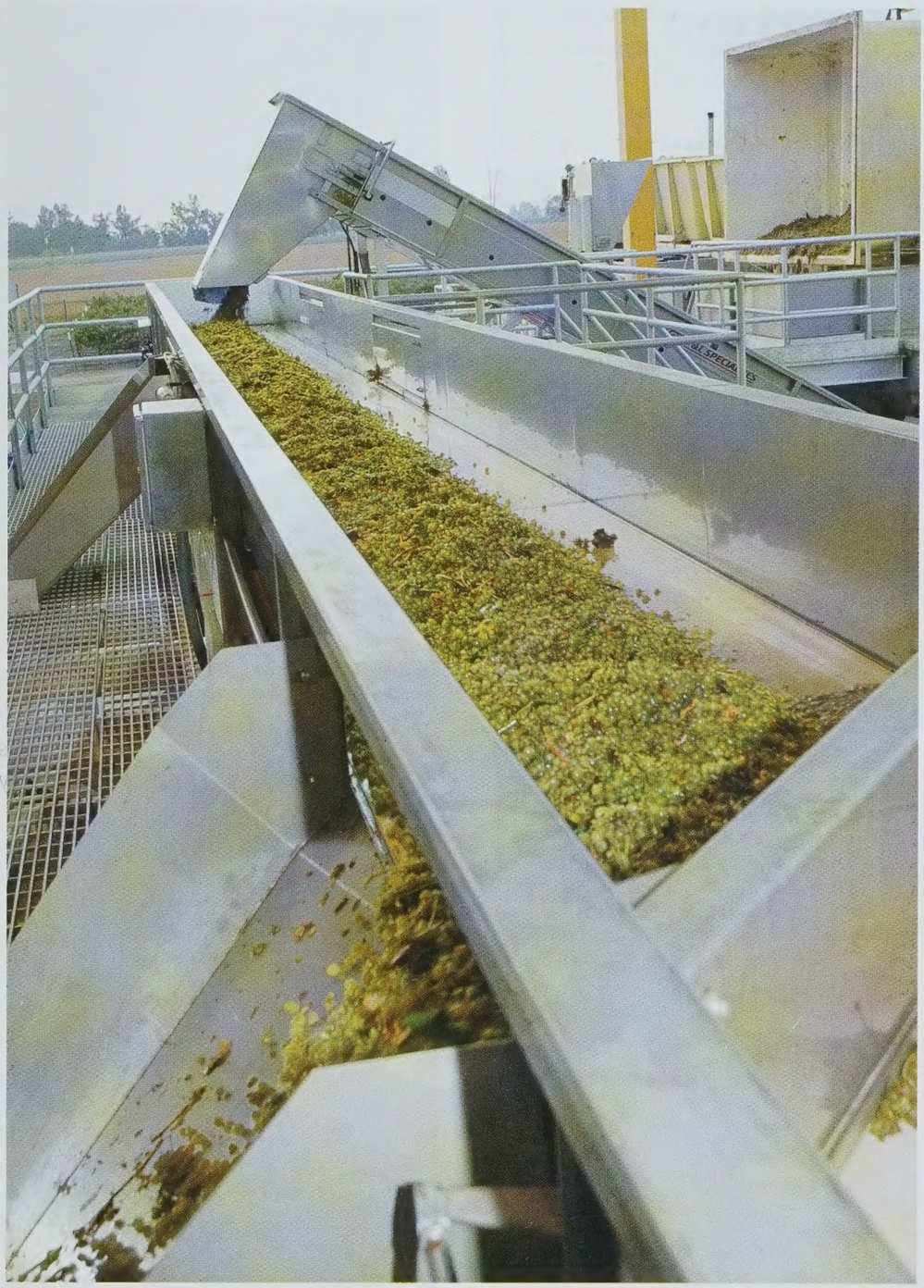
The design approach to accomplish this vision involved frequent open communication with Scheid personnel and custom winery clients, to ultimately provide winemaker David Nagengast with the tools to make quality wine.

The team saw the concept as similar to that in the baseball movie *A Field of Dreams*, but in winery design the expression became, "If you build it, they will use it." "You" referred to the owners, design professionals, and contractors, and "they" referred to the skilled artisans — winemakers and cellar masters — who turn high-quality Central Coast grapes into premium wines.

The winery is located south of Greenfield, CA just west of Highway 101, for easy access to receive grapes and ship bulk wine. It is centrally located to the majority of Monterey and San Benito County vineyards whose wine grapes it processes, which provides major cost and quality advantages (reduced maceration of grapes and oxidation of the juice). Short shipping distances mean low transit costs and allow machine harvesting of grapes.

A raised truck-dumping area allows whole-cluster or machine-harvested white grapes to be delivered directly to tank presses — 50 tons of whole-cluster whites or 60 tons of machine-harvested whites per press load — without any pumping. This is an effective and economical low-maceration design feature that produces significant quality benefits compared to crushing and pumping whites through an axial feed into a press.

A major design feature on the press pad is a grape receiving system that allows a quick changeover from red to white grapes. One automatic air cylinder changes the grape flow from the receiving hopper to a white inspection belt before loading into a press, or from

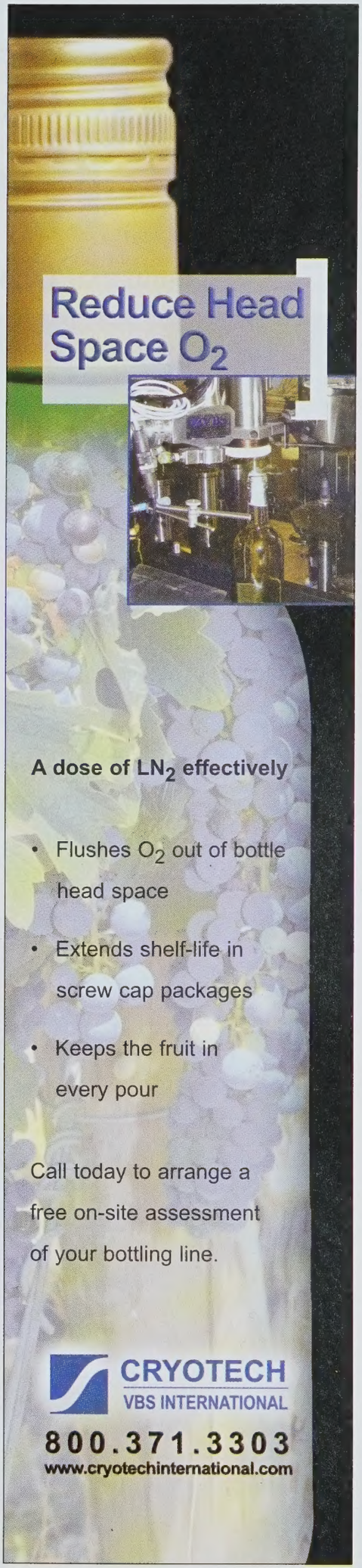


P&L Specialties' automated belt conveyor delivers fruit to any press door from one conveyor with minimal fruit damage and loss associated with multiple conveyor systems, and allows for hand-sorting of grapes as the conveyor can be slowed to 24 feet per minute (about 3 seconds per foot). There are 69 linear feet of conveyor where sorters have access to grapes.

the receiving hopper to a red inspection belt to destemmer/crusher to must pump. Hand-sorting capability at reduced throughputs (with variable speed belts) is available for both white and red grapes.

Cleanup required to go from reds to whites is confined to the stainless steel receiving hopper only. Belt conveyors that see red grapes never see white grapes, and vice versa.

The red, white, and pomace clean-in-place (CIP) belt cleaning systems allow a changeover from reds to whites to occur in a very short time frame; this saved the cost of a separate red and white unload-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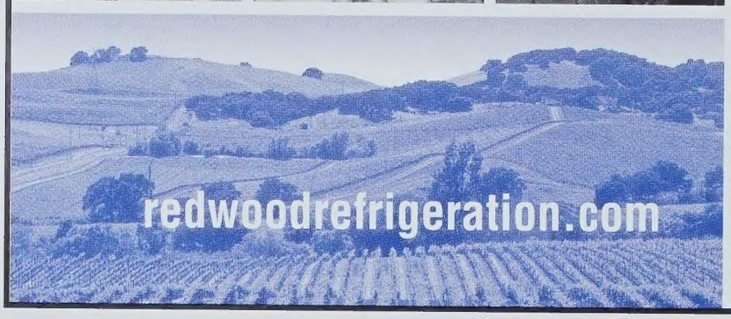

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Square bottom door (30" wide) of red fermentor minimizes bridging during removal of drained must.

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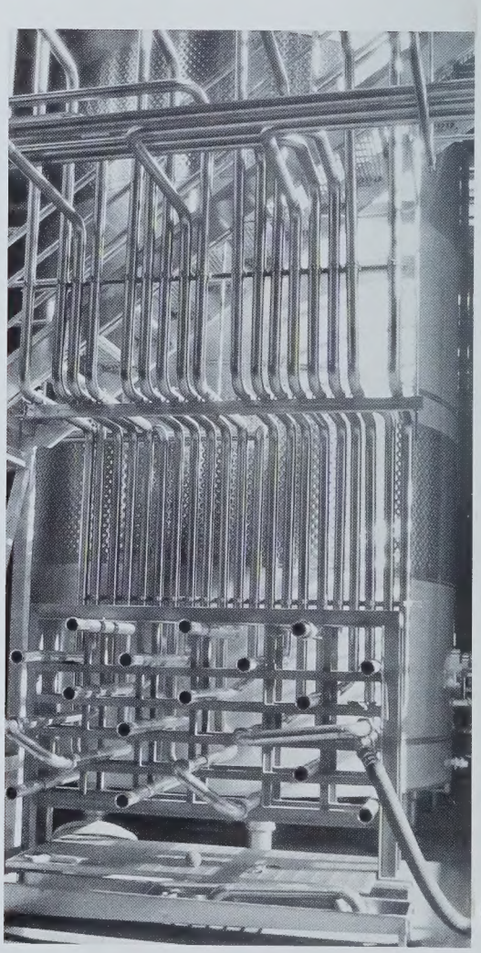


Wine transfer station allowing for movement of wine from one tank to any other tank in the winery.

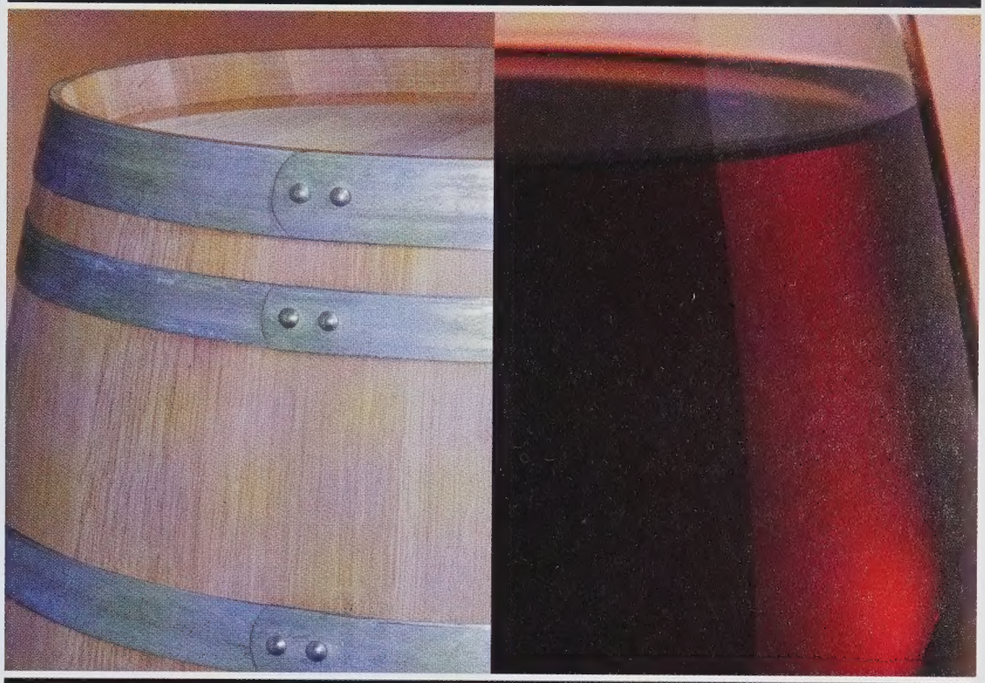
Pneumatic punch-down mounted on two I-beams for access to 6-ton and 12-ton open-top fermentors.

Three-way control valves for heating and cooling of tank jackets. Use of three-way valves eliminated two valves and actuators for each tank and saves maintenance time.

ing system in Phase I construction. Such rapid changeover and sanitation was a major factor in choosing a receiving hopper with a screw-feed versus a belted grape receiving hopper.

The receiving hopper has a stainless steel variable-speed screw with a wedge wire free run drain system for pre-draining ahead of the press that allows free run juice to bypass the press and increase pressing capacity. Pre-draining ahead of the destemmer has the added benefit of reducing juice lost through adhesion to ejected stems.

MADE FOR EACH OTHER.



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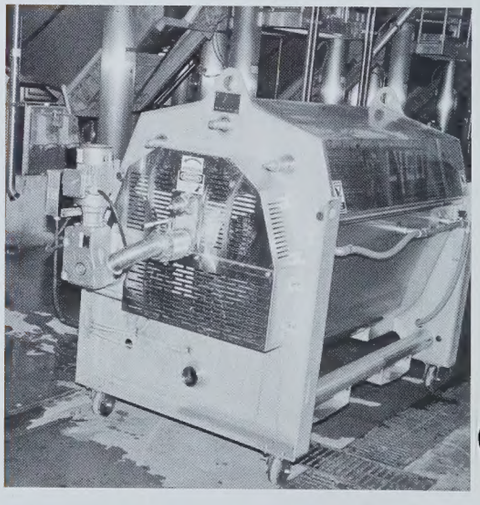
The 24-inch diameter progressive screw conveyor has three pitches: 12-inch, 18-inch, and 24-inch.

Grape receiving can easily be handled by three people — a weighmaster weighing in and out trucks; a receiving-hopper/press operator who unloads trucks via wireless control, fills presses, or feeds the destemmer/crusher; and a cellar worker who pumps either must or juice to tanks in the winery and performs sanitation and cleanup. All grape processing equipment is managed with an Allen-Bradley PanelView touchscreen display.

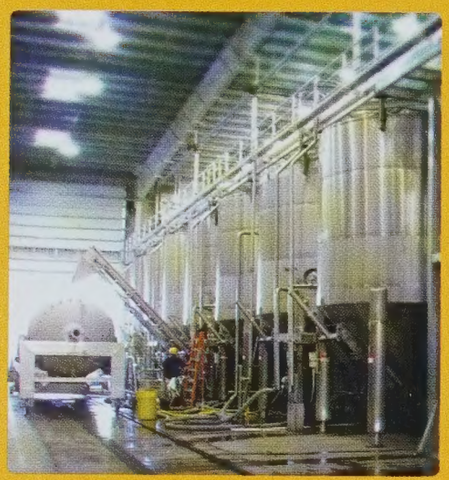
One frequently overlooked design feature of a winery is an extensive catwalk

P&L Specialties' incline conveyor has a proprietary "sealed sump" to collect free run juice, motorized head pulley for reliability, clean-in-place system for sanitation, and Rare Earth magnet for collection of material other than grapes (MOG). The conveyor belting is 36 inches wide with cupped cleats (2.5 inches deep) to convey gently and allow for high processing speeds of 100+ tons per hour.



Lycos rotating screen used to remove seeds during red fermentation pump-overs.

"Look Ma, No Hands!"



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The Scheid-slide is named after Scheid Vineyards who commissioned JVNW to build these tanks for their winery in California.

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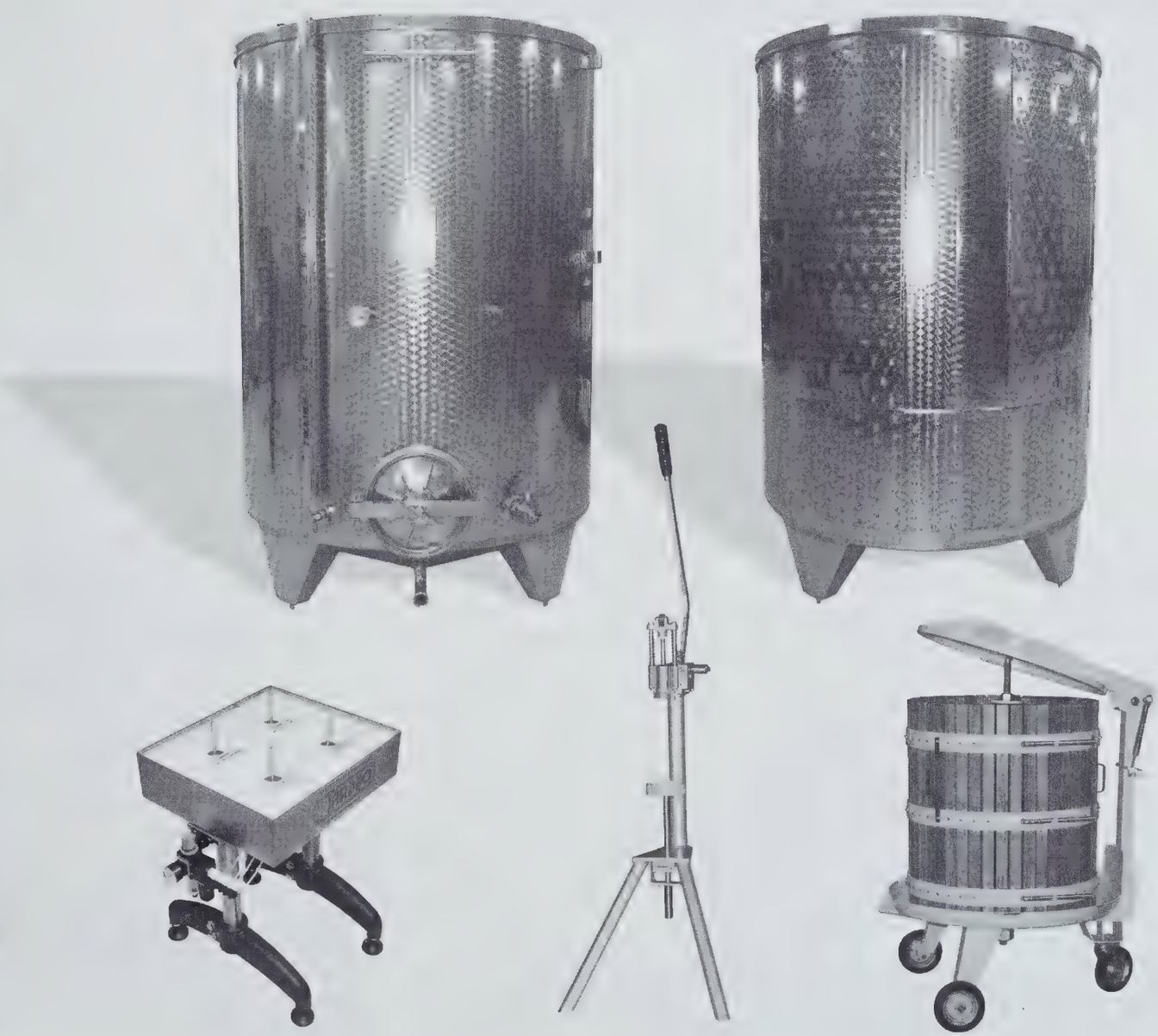

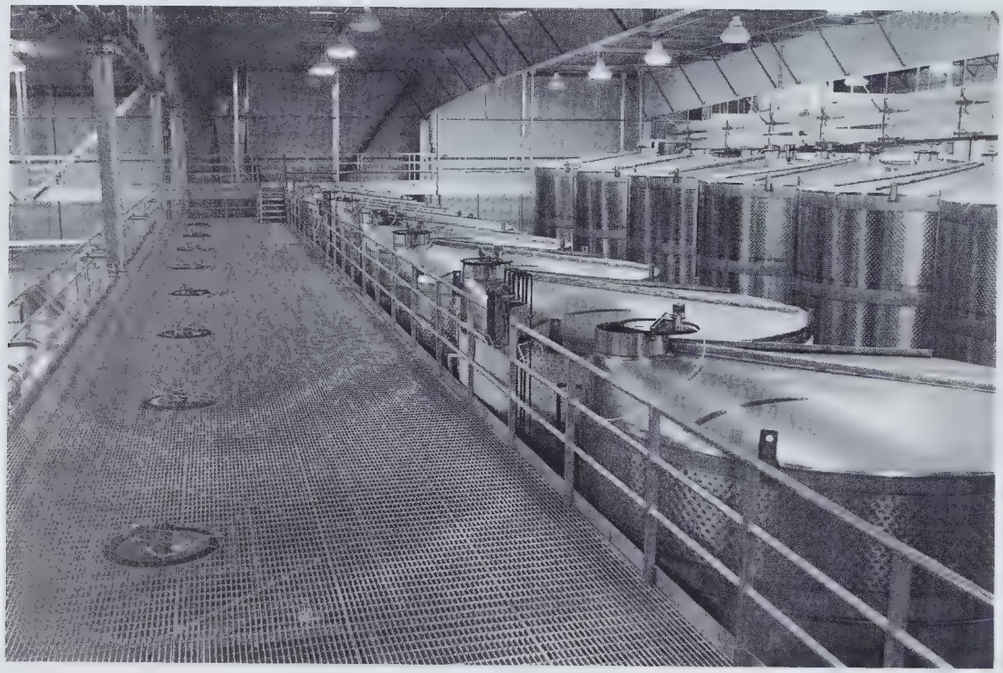

Catwalk platform over red fermentors, provides large open access to top man-doors.

system that allows operators to get from the truck dumping/crushing and destemmer/press area into the winery cellar, and to the top of each and every fermentor, with a minimum of stair climbing. This allows operators filling tanks to communicate with cellar workers in an effective manner and minimizes the chances of operator error and injury.

In the indoor winery cellar, there are three fermentation tank styles. All fermentors have one essential feature in common, which is that under normal winery operations, there is **never a reason** to enter a fermentor. This avoidance of routine confined-space entry means a major improvement in workplace safety. Labor, safety, and operating cost savings were an essential Scheid design requirement.

Three fermentor tank styles include: open-top fermentors with punch-down cap management, sloped-bottom red fermentors with automatic diaphragm pump-over cap management, and white wine fermentors. There is no sluicing, shoveling, screw,

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or tube screw-conveying of any wet must, to maintain quality at the highest levels possible. This, combined with whole-cluster white grape pressing, allow this large production winery to perform like a high-quality, low-throughput estate winery.

Open-top red fermentors receive 12 tons of grapes from a Diemme 90 destemmer/crusher with a progressive cavity must pump (six-inch outflow) through permanently installed six inch-diameter overhead must lines fitted with stainless steel 3-way ball vales for ease of sanitation. These fermentors are served by two traveling punch-down devices for cap management. They are used primarily for Scheid's high-value Pinot Noir program, which receives the gentlest handling possible.

The fermentors are mounted directly above gravity drain tanks to receive free-run wine. Fermented grapes are pressed off by a mobile tank press, which is gravity-fed directly from a fermentor, with press wine being pumped back to the free-run tank to maintain lot control or pumped to a separate tank. The 5-hectoliter (12-ton) fermented red mobile press is driven to the outside press yard to dump pomace into the pomace removal system.

All fermentors are equipped with warm and cold glycol in all jackets controlled with automatic three-way valves. This allows the cellarmaster to cool a tank prior to starting fermentation, then quickly warm a fermentor with warm glycol to jump-start a fermentation or to encourage malolactic fermentation. This system was installed to allow the winemaker and cellarmaster maximum flexibility to start fermentation, and to maximize the number of turns these high cost-per-gallon red fermentors can generate during harvest.

Tank temperature control is with TankNET® controllers, coupled with a special three-way ball valve developed specifically to work with them.

Red fermentors include 12,000 gallons, 19,000 gallons, 25,000 gallons, and 32,000-gallon tanks supported by tank legs designed to meet seismic zone-4 requirements, that were constructed by JV Northwest (Canby, OR). These fermentors are the workhorses of the red winery, yet they have the same features as the open-top fermentors, with the exception of punch-down cap management.

The fermentors each have a compressed-air diaphragm pump-over/cap irrigation system. Scheduling of this system can be automatic and programmed by the cellarmaster

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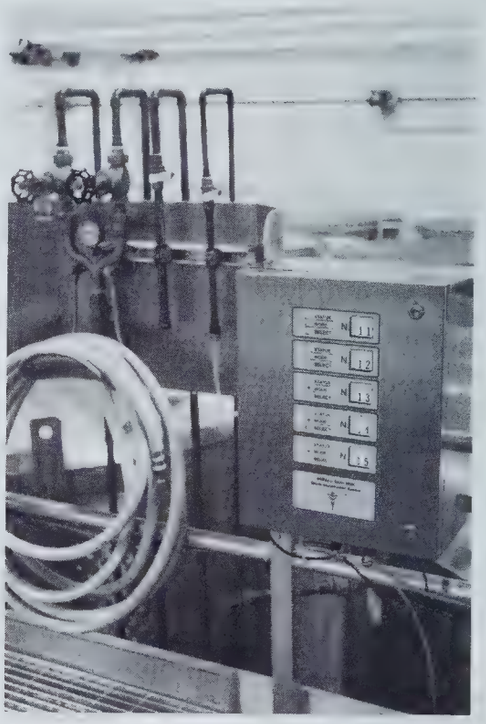
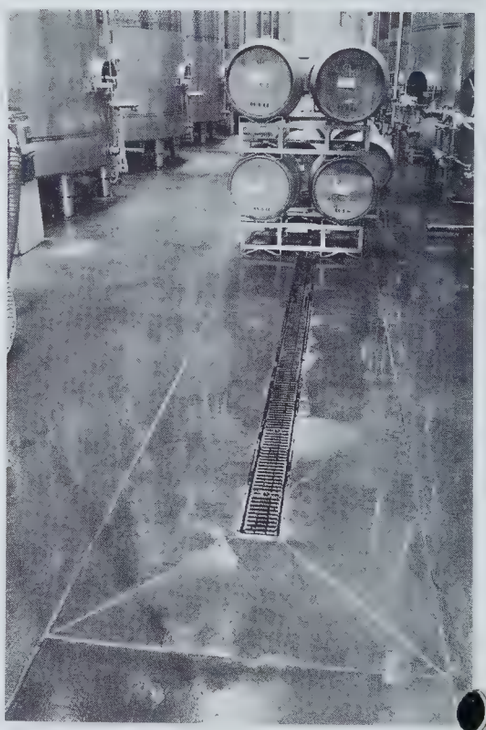
directly into the TankNET® controller, which serves dual duty as both pump-over and temperature controller. The advantage of having this controlled automatically is that the pump-over occurs when the winemaker requests it.

In the large red fermentors, which have warm and cold glycol jackets to maximize cellarmaster flexibility and fermentor turn-over, drained must slides out of the fermentor down a sloped bottom and through a 30-inch square door, to minimize bridging. The



Catwalk-mounted hose station with hot and cold wash-down water, compressed air, and nitrogen supply. Each station has a 50' hose allowing wash-down anywhere in the building. The Parsec micro-oxygenation system for 120 tanks has five-tank remote controllers (right in photo) throughout the tank room.



All floors are sloped to trench drains with oversized drainage piping, to allow quick drainage of surface liquid anywhere in the building.

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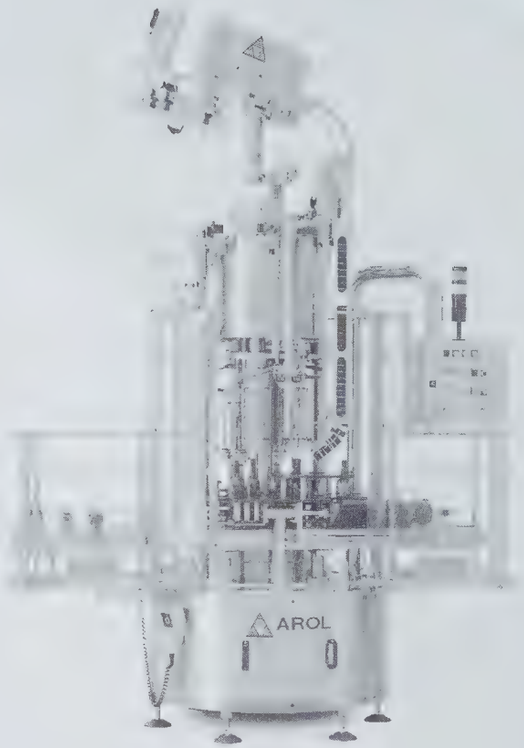

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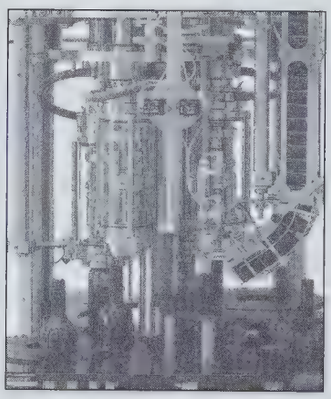

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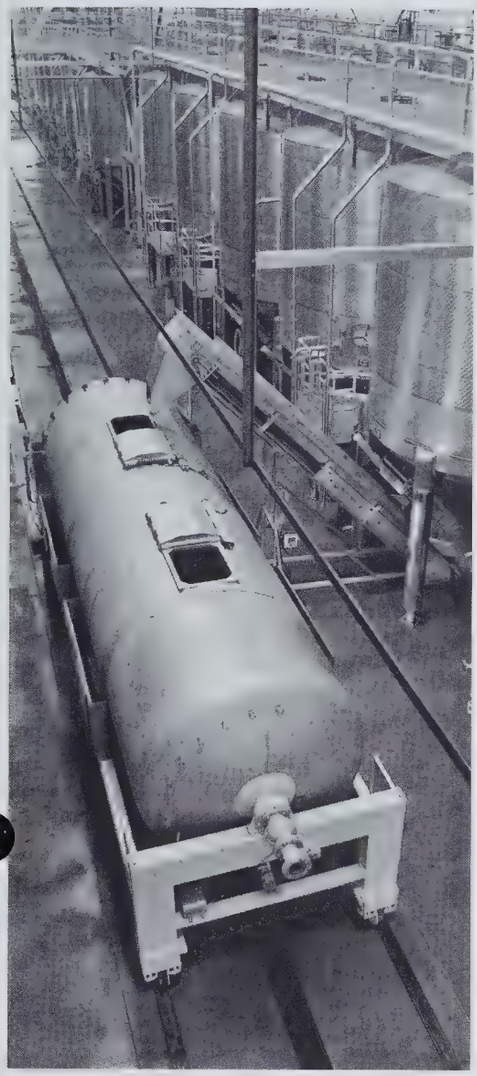

Rolling press in loading position.

must is then elevated by a crescent belt incline conveyor directly into a traveling tank press. This press does double duty (on the press pad) as a white press when not pressing reds. The wine is pressed out in-place in front of the fermentor. The press then travels to the press yard to unload the pomace.

All three types of fermentors are located indoors in an insulated building. Skylights occupying 3% of the roof area allow natural light so the winemaker can better judge wine color during the day. This earned Scheid a utility-company rebate to cover part of the added expense.

At night, the facility is well-lit with high-density metal halide light fixtures, to provide high-quality white

photo taken at St. Francis Winery

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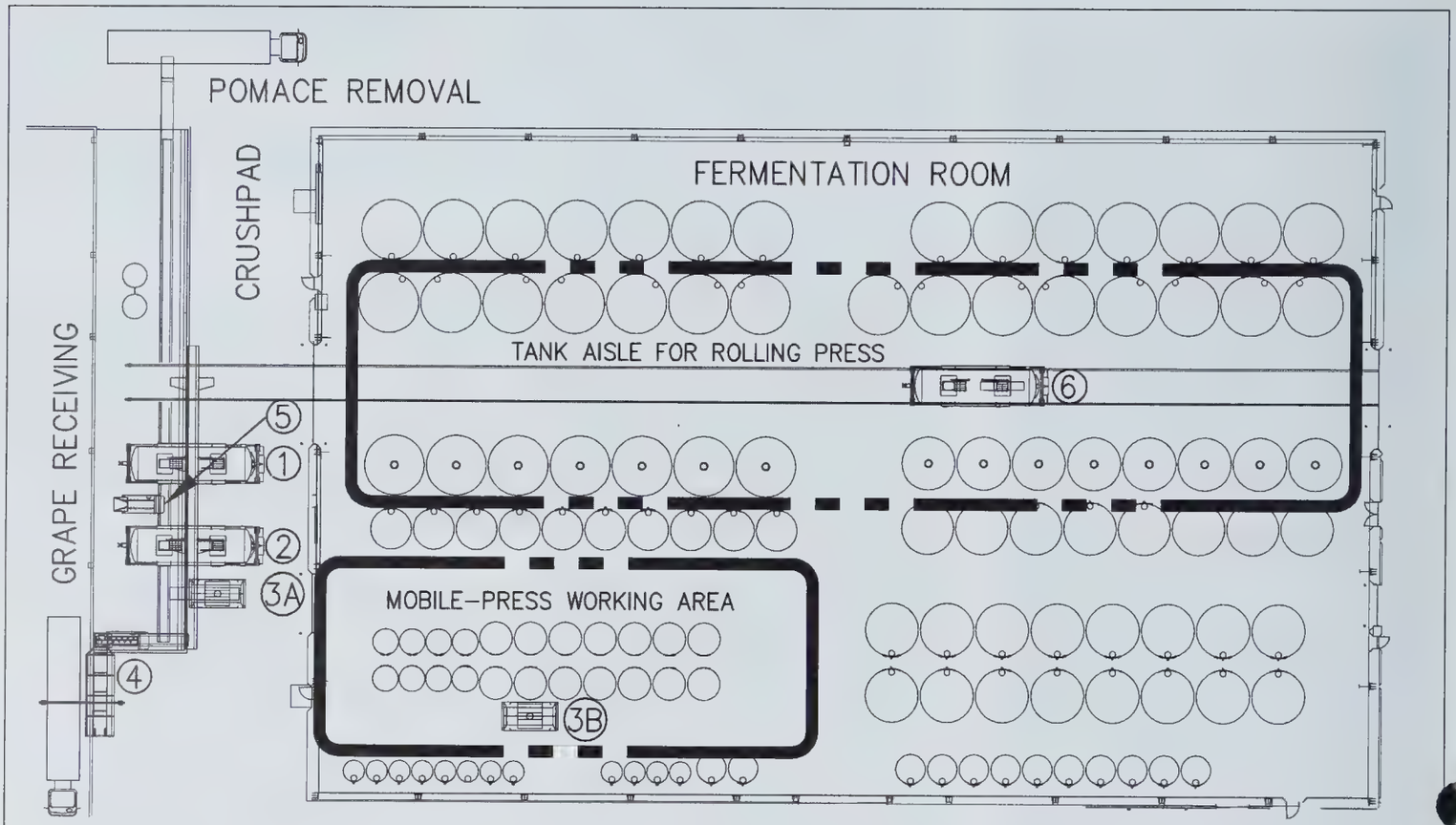
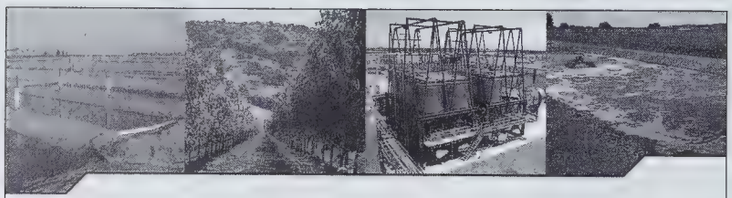


1. Diemme Millenium 430 Press
2. Diemme Millenium 430 Press

3A. Diemme AR 50 Mobile Press in pomace dump position

3B. Diemme AR 50 Mobile Press in fermented grape collection position

4. Grape receiving hopper
5. Diemme Kappa 90 Destemmer/Crusher
6. Diemme Millenium 430 Rolling Press in loading position



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light with a bare minimum of shadowing. This provides a safe work area during all hours of the night, to keep nighttime operations on a par with daytime operations.

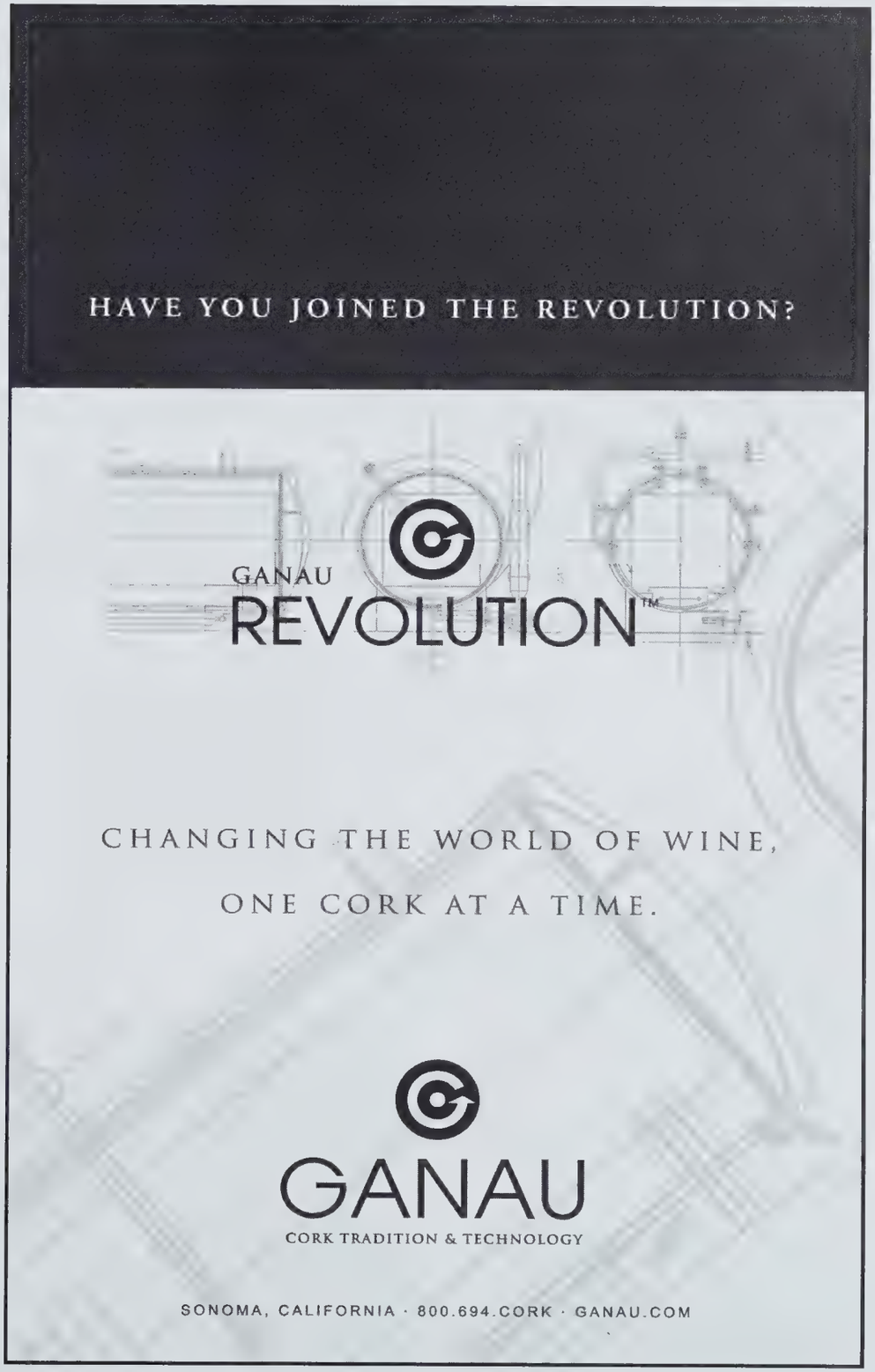
The walls and roof are insulated urethane panels. No additional mechanical cooling is required to maintain a year-round ambient temperature of 60°F to 62°F, beyond the radiant cooling from chilled wine tanks. Future plans call for a 55°F mechanically-cooled storage room with unjacketed storage tanks for optimum wine storage.

Sanitation is a major issue in every winery and Scheid Winery's spacious and open work areas were designed with ease of sanitation in mind. Roof-support columns, catwalk-support columns, and pipe supports are minimized to improve sanitation. Concrete floors all slope to continuous floor drains at sufficient slope to avoid pooling and standing water.

The industrial waste piping is oversized to avoid backing up of drains and pooling of water on the floor when cleaning tanks. No working area of the winery is more than 50 feet from a Strahman hot and cold water mixing wash station capable of delivering 75 psig water pressure at temperatures ranging from cold to 180°F for tank sanitation.

The walls and ceiling have no open insulation, and are suitable for direct wash-down. All platforms and catwalks are of aluminum construction to avoid corrosion, and the building's steel surfaces are painted with an epoxy paint system.

The entire winery is designed with a three-inch diameter sanitary wine pipe system feeding to central connection stations. Any wine tank or press tank can be connected by sanitary wine hose to any



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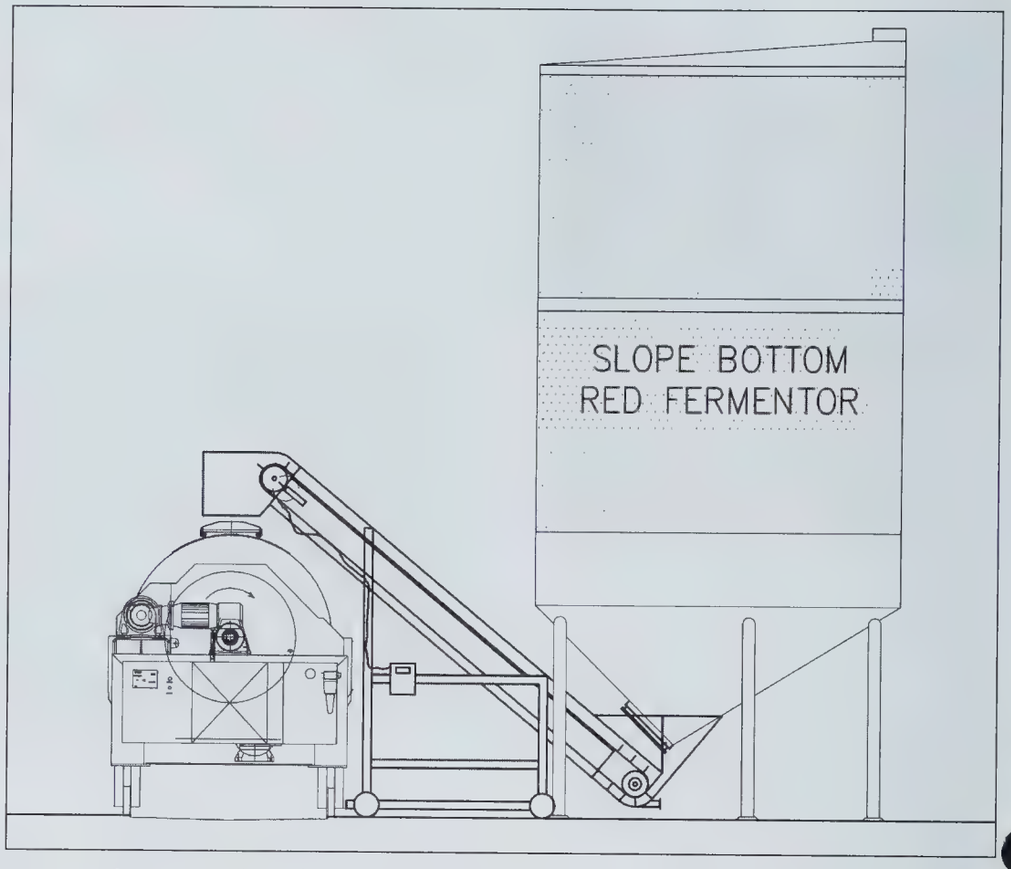

Fermented must is delivered to rolling press by incline conveyor.

other tank or tanker truck loading station through these connection stations and the stainless piping system.

The utilities are all routed overhead, supported from the catwalk system, out of the production area. They consist of hot and cold water, compressed air, an inert gas system, hot and cold glycol, and a micro-oxygen system for certain wine tanks used for custom-finishing of wines on request from customers.

Hidden parts of the winery also show Scheid's commitment to quality. The employee services area has wash-down floors, more than adequate space, and a full locker room for both male and female employees. The mechanical room and refrigeration room are in structures attached to the winery and only accessible to authorized personnel. They consist of a forced-draft Bryan hot water boiler, a VFD-style Atlas Copco air compressor, and 3,000-gallon hot water storage tank with a winery recirculation system for instant hot water availability.

The refrigeration system is ammonia-based for green environmental

New tank installation for phase two expansion of the winery. Many of the tanks will be enclosed by a new building to be constructed.

purposes, with Vilter compressors and Evapco evaporative condensers. This is a highly efficient refrigeration system and is expandable with an additional compressor to handle the forecasted build-out to 30,000 tons of grape crush.

The winery collects all waste water, prescreens and pond-aerates it for BOD reduction. This water is ultimately used for vineyard irrigation and serves dual duty as the facility's fire protection pond. Pomace is collected and stored on site, where it is composted and added back to the vineyards as part of the farming operation. ■

Tim Ryan P.E. is principal in charge of winery projects at Axiom Engineers℠. Axiom's team includes industry veterans Ray Cole and George Deponte who have designed wineries ranging from 2,000 cases per year capacity to 40,000 tons per year.

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Integrity Award to James Trezise

NY Wine & Grape Foundation

BY Millie Howie

Three long-time industry associates stood with an enthusiastic audience to salute James Trezise, president, New York Wine & Grape Foundation (NYWG) as he received the 2006 Wine Integrity Award in November at the Lodi Wine & Visitor Center, Lodi, CA. The Wine Integrity Award was created by the Lodi-Woodbridge Winegrape Commission in 1998 to honor individuals who have conducted their careers with integrity while making significant contributions to the wine industry.

Trezise, who has been president of NYWG since its formation in 1985, has been involved with the wine industry since 1982, and during that time, he has tirelessly promoted New York wine, inspiring New York producers to compete with the finest wines in the world. Through the highly successful and ongoing "Uncork New York" promotional campaign, wine lovers have been introduced to the history, variety, and availability of New York wines. He has advanced the cause of direct shipping and helped build the New York Wine & Culinary Center (opened in 2006).

Born and raised in Rochester, NY through his high school years, Trezise graduated from Allegheny College in Pennsylvania with a degree in psychology. After college, he enlisted in the U.S. Navy and spent two years in Washington, DC working on the naval magazine "All Hands." When he finished his tour of duty, he and his then-wife, Lois, left for France where she was studying to become a midwife.

For three years, Trezise took any job that was offered, working at a patisserie, as a waiter in a restaurant, and as an English teacher. Meanwhile, he immersed himself in following accounts of the Watergate affair in the foreign press and the newspapers back home. He co-authored a book with James Stovall, (Edward J. Meeman Distinguished Professor of Journalism at the University of Tennessee), *Watergate: A Crisis for the World*, which he calls a "social science book which probably did not sell very many copies."

As for wine, Trezise looks back and, with what seems to be a bit of surprise, recalls that "in my college years, my beverage of choice was already wine, and while living in France, though the wine often came out of a jug, it was better and cheaper than milk. Without any conscious intent on my part, wine became a permanent part of my lifestyle, even when the only bottle of wine I could afford was Algerian at $.75 per bottle."

On their return to the U.S., the young couple rented an apartment on Capitol Hill right behind the Senate Building in Washington, DC. As a 30-year-old with few marketable skills, Trezise worked as a temporary secretary at Kelly Girl before finally landing a job with Conrail (Consolidated Railroad) in Washington as a secretary in the lobbying office.

He was working his way up through the ranks, and Lois had just been offered a good job in Philadelphia when he had his first interview with the Winegrape Growers of New York State. Despite the risk, the young couple packed up and drove two U-Haul trucks through a blinding blizzard to New York on Valentine's Day, 1981, leaving his secure corporate job for a gamble.

James Trezise

When the embryonic wine organization closed its doors, a group of 10 growers refused to give up and dug into their own pockets for money to keep it going. At a meeting at Glenora Wine Cellars (Dundee, NY) the group asked Trezise what they should do. He replied, "I believe in this industry. Let's get back to work." One year later they ran out of money again. Canandaigua Winery came to the rescue and they formed the New York Association of Wine Producers. The growers voluntarily increased their dues and set about to see what could be done.

The new group became the New York Wine Council with a membership composed equally of growers and wineries. As they gained strength, they took their cause to then-Governor Mario Cuomo and the state legislature. As Trezise recalls, "We told them that they had this big important grape industry going down the tubes. They listened. By 1984, they had passed a new law permitting the sale of wine coolers in grocery stores."

That "wine cooler" legislation turned everything around. By the next year, the New York Wine & Grape

Foundation had come into being and Trezise became the first president; a position he has held ever since.

The Foundation is a private, not-for-profit organization that sponsors research and conducts promotional programs in support of New York grapes, grape juice, and wine. As president, Trezise is involved with several national and international organizations focusing on key issues affecting the grape and wine industry worldwide.

He serves as Director of Communications of the International Federation of Wines and Spirits, is a member of the executive committee and board of directors of WineAmerica and is co-founder of the American Wine Alliance for Research and Education.

Comments by the three presenters ranged from typically humorous "roast" remarks to strong endorsements of Trezise's dedication and accomplishments. With the ease of long friendship, Bob Hartzell (former president of the California Association of Wine Grape Growers), had the crowd laughing along with Trezise as he elaborated on some hypothetical tales of things that could have happened, but fortunately never did.

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Award of Merit to Tim Spencer

BY Mark Chandler, Executive Director
Lodi Woodbridge Winegrape Commission

This year we honor the late Tim Spencer of St. Amant Winery for his many winemaking accomplishments, which have helped enhance the Lodi reputation and attract greater recognition to Lodi wine with the Award of Merit.

Tim was truly one of a kind. His casual appearance and demeanor belied his expert knowledge of wine and port and the respect with which he was held in the industry, nationally and internationally. Tim blazed his own trail through the California wine business, and we were lucky to have him ply his craft in Lodi, CA.

Tim was knowledgeable, but not pretentious. He was mercurial, and often profane. Anyone who knew Tim would agree that he was refreshingly, disarmingly honest, and straightforward. That was his stock in trade, and the core of his great dry sense of humor. It was what endeared him to the grower community, and to the hundreds of people who passed through the St. Amant Winery each year.

Tim started in the wine business in the 1970s as a partner in a wine shop in Stockton, CA. Later he planted a vineyard in the foothills. He was one of the early pioneers in White Zinfandel, or Zin Blanc as he labeled it.

Tim's commitment to Lodi wine began in the early 1990s when Lodi appellation wines were few and far between. It was a long-held notion that if Lodi grapes got the same handmade attention that coastal grapes received, we could make a similar quality wine.

I convinced Tim to make a few barrels of Zinfandel for the Lodi Woodbridge Winegrape Commission under our "Signature Wine" program. We bought the fruit from Chuck and Bettyann Spenker's vineyard, and the wine came out really great. We sent samples of that wine to hundreds of winemakers all over California, and in many cases it was their first, eye-opening taste of Lodi wine.

That early experience set Tim on a path of making Lodi wine. We continued the Spenker Zinfandel program for several years until the winery population developed to the point where we had a large pool of truly excellent Lodi wines to work with.

At one point in the mid-1990s, most of St. Amant's vineyards were being replanted due to phylloxera. So being short of grapes, Tim invited Lodi growers to bring in two tons of fruit, and he would make the wine, which they would share evenly at bottling. The wines Tim made opened the eyes of many growers to the quality of the fruit they delivered, and encouraged them further on the path of quality enhancement.

It was during this time that he struck up a relationship with Jerry and Bruce Fry that led to St. Amant's legendary "Marian's Vineyard" Old Vine Zinfandel, and the popular Mohr-Fry Ranch Zinfandel. The 2001 Marian's Zinfandel won best Zinfandel of California at the 2003 State Fair.

In typical Tim style, he maintained no set tasting room hours, yet he was almost always at the winery. He used to marvel at how many people found his place. He would say, "look at all these people — and we're not even open!" His marketing was mostly word of mouth, and he enjoyed a fiercely loyal following. The word of mouth was about his wines surely, but also about the curmudgeonly but endearing winemaker that Tim was.

Tim was popular with consumers because when they left his winery, they left with much more than wine. They left with more knowledge about wine, and that led them to more confident wine enjoyment. ■

Jim Finkle, Sr. (vice-president external affairs, Constellation Brands, Inc.), spoke of Trezise's firm belief in the economic power of "culinary tourism" — the pairing of great food and wine. "His New York Wines and Dines program," said Finkle, "has gained the support of Senator Hillary Rodham Clinton with the result that New York's signature cuisines and wines are showcased annually in Washington DC in one of the most anticipated receptions hosted on Capitol Hill.

"A true communications professional — both personable and passionate — Jim brought a combination of leadership qualities to the table that no one else could. His extraordinary ability to keep a smile on his face, even in the face of adversity, was just one hallmark of his personality that won people over.

"He helped set an energizing tone for the industry which was equally matched by his determination to unite its stakeholders for the greater good — as evidenced by this distinguished honor bestowed upon him by the Lodi-Woodbridge Wine Integrity Award for 2006.

"With Jim's encouragement, New York wineries began to participate in wine competitions around the country, inspiring commitment and visions for what could be achieved. Today, New York wines are being recognized for top-notch quality by wine lovers around the world and more people are visiting New York's wine regions than ever before. For these reasons and more, Constellation Brands, Inc., looked to Trezise for insight to develop the New York Wine and Culinary Center (Canandaigua, NY) which opened early in 2006 to much fanfare."

Wine journalist Dan Berger reminisced about Trezise's ability to "work diligently, stretching a desperately thin budget to satisfy the demands of all the various grape factions he was representing: from growers supporting the cause of native American grapes, to those hybridizing French and American grapes, and the small number of growers seeking to introduce Vitis vinifera in less than friendly terroir. "One of Jim's most difficult tasks," Berger recalled, "was moderating a legendary dispute between Dr. Konstantin Frank and Walter S. Taylor, which he accomplished with skill and grace.

"When Jim took over the reins of the Association in 1982," said Berger, "there were only 25 wineries in the entire state of New York. Today there are 240, and to Jim should go the credit for the increase in quality of New York's grapes and wines as the industry grew.

Someone once suggested that we should have a national wine czar. My response is that I believe that Jim would be the perfect person to carry that title." ■

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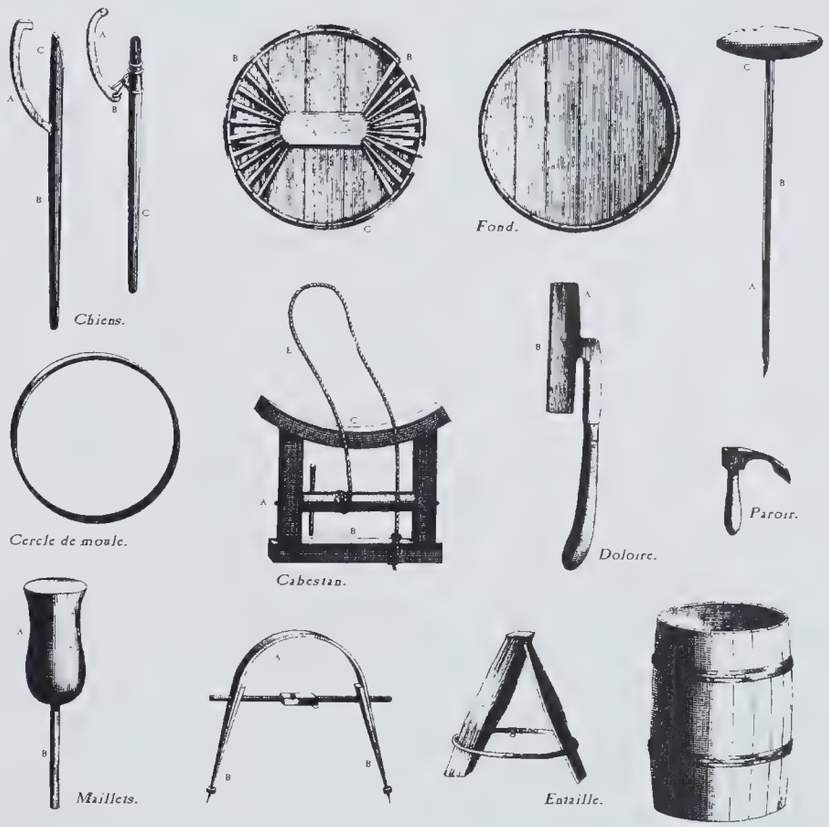

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Selling wine to experienced sommeliers

Strategies to achieve placement on wine lists

BY Ron Edwards, Master Sommelier

Love for wine drives all aspects of a sommelier's work. A wine list is not just an opportunity for the restaurant guest to enjoy wine, but it also expresses the essence of what and who the sommelier chooses to be.

Creating a restaurant wine cellar is both a cerebral and an emotional task, and distributors or winery representatives who know this will deal with a sommelier-buyer from that perspective and will be much more successful at placing their wines.

What are the issues of paramount concern to a sommelier who is considering your wine for his or her wine list? First is the cuisine offered by the restaurant, then the wine's "trueness" to its varietal and birthplace, its ratio of quality to price, its uniqueness, its presence in the marketplace, and finally, the size of the restaurant's wine list.

Cuisine

A restaurant's style of cooking significantly affects choices for the wine list. A restaurant featuring fresh seafood should have a very different list than a steak house. How important is this to a sommelier? Marnie Old (Advanced Sommelier in Philadelphia, PA) says it loud and clear: "I've seen lists that bear zero relationship to their menus, and it drives me bananas. In those cases, the wine buyer is abdicating responsibility to someone else: to the *Wine Spectator,* the market, or average Joe, none of whom know a thing about what's on the menu."

Restaurants with a strong ethnic theme must have a wine list that reflects that ethnic background but leaves room for expansion to other regions. Kathryn Morgan (Advanced Sommelier at Tosca, a respected Italian-themed restaurant) understands this intimately. Her list is 90% Italian because the food demands it and 10% U.S. because she is in Washington D.C.

A large number of restaurants in the U.S. now feature the melting pot of flavors that is American cuisine, and the wine lists must offer a corresponding range of flavors with a wide variety of wine styles.

Award-winning Tapawingo (Ellsworth, Michigan) is a restaurant that represents this challenge perfectly. Its menu changes daily, illustrating both seasonality and strong swings in styles of cooking. These two challenges require a cellar that is diverse, so a Tapawingo diner discovers the world of wine represented by an interesting mix of both region and grape variety.

Trueness of varietal and place versus atypical wines

David Glancy (consulting Master Sommelier in San Francisco, CA) distills this concept into one sentence, "If the world expects a certain aroma, flavor, character and style from a specific grape or protected place of origin, then we should not surprise them."

When a sommelier asks for a Tuscan Sangiovese, he wants flavors of red currant and cherry, a little lemon zest acidity, edgy tannin, an iron/blood undertone, and a wine that "speaks" in Italian. One could argue that sommeliers are close-minded and that not all Tuscan Sangiovese fit these descriptors. One might win the argument, but not the heart of a sommelier.

While sommeliers do not wish to put the world's wines into neat and inescapable boxes, they do believe that the uniqueness of the world's wine regions is just as important as grape variety. That uniqueness can only be praised and explored when the wines reflect the typical characters of their region and do not project the persona of a different region.

In Tosca's cellar, Morgan explains, "It is critical that some of the wines in the category are typical." Then, because a classic example is always present, she has the freedom to buy wonderful wines that are atypical.

Quality-to-price ratio

Ratio of quality to price is a slippery slope, but a major issue in choosing wines. "All sommeliers look for overperforming wines. Wines whose overall harmony and length of finish exceed the expectation for their price tier," observes Old.

"The goal for me," says Sommelier Michelle DeHayes (Matt Prentice Restaurant Group in Detroit, MI), "is to find the wine in any price point that is memorable for the individual guest."

When a Napa Valley Cabernet Sauvignon lands in a glass, it does not stand there alone. It must compete with all wines of similar ilk and vintage. The wine left standing as the most impressive for the price will inevitably end up on the wine list.

Uniqueness

Uniqueness is also a major factor in whether a wine obtains a yea or nay from a sommelier-buyer. Because the wine list is a reflection of the individual sommelier, he or she insists that it be different. Wines that are unique in their regional character, quality, avail-

ability, or varietal content are significantly more attractive.

These wines evoke discussion and stories at the table and help create that much-desired relationship with guests. In fact, uniqueness will overcome the quality-to- price ratio in almost every case, because value is added to the wine experience when the wine's uniqueness adds a level of fascination.

One misguided thought is that rarity and uniqueness are interchangeable, but they are not. Unique wines need not be small production but instead are wines that guests would not have thought to buy on their own.

From DeHayes' perspective, "Wines like these are 'hand sells' and require the individual attention of the sommelier or an enthusiastic service staff. If both the wine and the staff hit on all these levels, you've just introduced a number of guests to an interesting alternative that never would have occurred to them. How cool is that!"

Rarity

Presence in the market can be a positive or a negative influence in the wine-buying process. If a wine is a great value for the quality, yet is an ever-present standard on retail shelves and wine lists, then its market presence is a negative for a sommelier. That is not an indication of the wine's quality, but rather, a reflection of the sommelier's wish for self-expression of his art.

"I don't deal with anything that's floor-stacked in a retailer or advertised in the newspaper with a big photo," Morgan remarks.

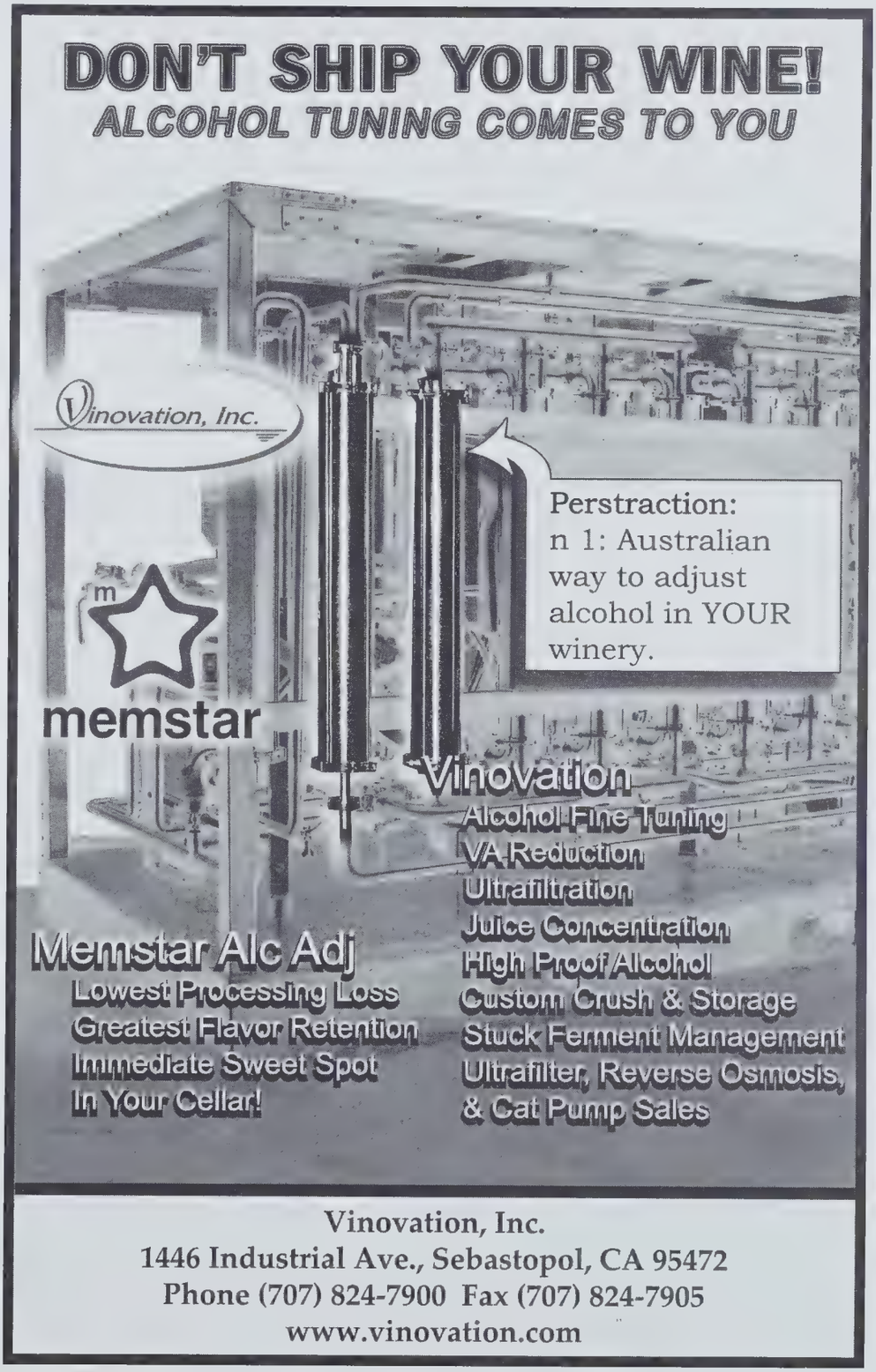
On the other hand, a high quality wine that is rare in the marketplace may override considerations of value. Glancy deals with rarity like this: "There are many trophy wine shoppers, and I must appease them on a high-end wine list. Actually, it is nice to have at least a few of these wines on any list."

Size of wine list

Size of the wine list is the last concern that is universal to sommeliers. Some are working with small lists that change frequently, others have a medium-size list that includes hundreds of choices, and finally, there are large lists with lots of everything. Each style of wine list requires a different strategy from the sommelier and wine representative.

Small wine lists are a wonderful adventure that require imagination and tremendous discipline. With the world of quality wine ever expanding, the sommelier's desire to have something from everywhere is hard to control.

Old says of this challenge: "It's far harder work to manage an efficient list of 300 or 400 choices in the fine dining arena and even more of a challenge to keep it under 100."



Sommeliers running wine lists of 150 choices or less will be extremely selective. In order to buy one wine, a previous wine that was carefully chosen must be eliminated. "Anyone can open a text book or the trade magazines and write a best-of-the-best wine list, but the challenge is to write a small list that still offers a variety of styles, regions, producers, and price points," Glancy adds.

Medium-size wine lists will have 150 to 400 choices and can offer much opportunity to showcase the world of wine. In this range, the desire to have a world class list is there, but the budget may not be.

Even on medium-size lists, it is still challenging to make the right choice, because a region can only be represented as one part of a larger whole. A very important balancing act goes on in the minds of these sommeliers as they try to feature the world and yet keep inventory under control.

Large wine lists show a pure love of wine that often exceeds the logical use of dollars. Wine lists like this are an absolute joy for a wine connoisseur to wade through. These programs may be the easiest to get a wine into, but they are the hardest to sell any volume.

Sommeliers who control large wine cellars are generally very experienced and seek quality above all else. Restaurants featuring wine lists of this scope are usually high-end and expect a larger financial commitment from guests.

It will be unproductive for sommeliers of high-end lists to feature value-oriented wines that do not ring of special occasion, but they will have a field day selling their guests wines from $80 to $120 at every seating.

Wines that are considered for a special occasion at other venues will be poured by the glass at such high-end restaurants, so distributors and wineries have great opportunities to promote wines differently in these wine-savvy dining rooms.

Tasting menus with wines paired are often found at this level and are an excellent opportunity to promote wines in the right context. Such contextual wine exploration is the key to exciting guests with the new and unusual and would be a great focus for any distributor working with wine's unsung heroes.

Achieving success

Thirst for wine knowledge and enthusiasm are the most valuable characteristics of a successful sommelier. Smart distributors capitalize on these two qualities as they cultivate long-term relationships with sommeliers. Sommeliers expect suppliers to be excited and informed.

The distributor who comes in knowing his wines from vineyard to bottle is a sommelier's dream-come-true, because sommeliers want to know everything about the wines they choose to sell. Sommeliers refuse to be "sold," but are easily wooed by greatness in the bottle. Sommeliers are annoyed by supplier allocation games and will often choose to buy a different producer to avoid strong-arm tactics.

Distributors who respect the sommelier's passionate commitment to wine quality and recognize the issues that motivate world-class sommeliers will find these wine buyers to be an enjoyable respite from the cold, uncaring world of cookie-cutter wine programs. ■

Master Sommelier Ron Edwards can be contacted at: ron@fivestarsommelier.com. Ron Edwards puts the skills of a Master Sommelier to work for clients through service and hospitality training; wine, spirits, and beer education; wine and beverage program development; restaurant systems development; and private wine events.

Scott Henry with a twist

BY Richard Smart

I recently visited two Sonoma County vineyards in California with Peter Opatz and Isaul Macias to learn about "Macias 12," a new method to facilitate shoot positioning of the Scott Henry trellis.

In winter 2005, we visited Hoot Owl Vineyards in Alexander Valley, where Macias has been vineyard foreman for 26 years, to see the effect of Macias 12 on the vines. We visited the Green Valley Vineyard in Russian River Valley, managed by Vino Farms (Lodi, CA), before harvest 2006.

Opatz, viticulturist for Vino Farms North Coast, is responsible for viticultural activities on 54 ranches that Vino Farms manages in Napa and Sonoma Counties. Vino Farms (based in Lodi, CA), also has operations in Monterey, San Luis Obispo, and Santa Barbara counties. Vino Farms is a managing partner on many vineyard properties, making it one of the largest vineyard management companies focusing on Lodi and the Coastal regions of California.

In addition to his work at Hoot Owl Vineyards, Macias is a vineyard consultant for Vino Farms. He and Opatz have had considerable experience with the Scott Henry trellis in Alexander Valley and Russian River Valley, and they understand that this system is very suitable for higher vigor sites, both to improve grape quality and reduce disease pressure.

Macias was keen to facilitate harvesting and other vineyard activities such as pruning throughout the year by finding a way to eliminate the restraining wire for the lower canes with the Scott Henry trellis. (Some growers use two wires, one on each side of the post, to hold down the downward-pointing shoots. I have found that only one is necessary.)

When a Vino Farms crew goes into a vineyard to hand-harvest, for example, grape lugs may be pushed across as many as four rows for more convenient collection. If there were no wires in the way, the boxes could be moved sideways through the rows much more quickly. Macias 12 is a solution to this hand-harvesting problem.

Cracking the canes

Macias calls his method the "Macias 12," since workers are able to crack two canes on a vine in 12 seconds. What do I mean by "crack"? The canes can be cracked once the cambium begins to slip against the xylem, and you can peel off the green "bark" layer. This occurs before bloom, usually when shoots are about 12 to 18 inches long.

Using two hands, it is possible to twist the cane in two opposite directions at the base. This causes a partial rupture of the tissue, and the cane becomes weaker and is easier to twist in a tangential direction. This means that, as the shoots on the cane grow longer, their weight will cause the cane to twist, and the shoots will point downward due to the weight of the foliage and grapes.

Interestingly, when the canes are cracked like this near their base, a small swelling develops but seems to cause no harm to the vine.

The Macias 12 method has been in use in Hoot Owl Vineyards since 2004 and began at Green Valley Vineyard in 2006. At Green Valley Vineyard, a 40-acre block of Pinot Noir clone UCD 16 was planted in 2001 on a very vigorous, high-yielding site located on a flood plain. It produced up to

Isaul Macias demonstrates cracking of two lower canes of Scott Henry trellis to Miguel Loza, vineyard foreman at Green Valley Vineyards. [photos by Don Neel]

Macias twists shoots from lower cane downwards.

Macias inserts shoots from upper canes within catch wires.

Macias explains the "Macias 12" input on Scott Henry trellis to Richard Smart before harvest (extra leaves removed to display fruit zone).

7.5 tons per acre with a cordon-trained vertically shoot positioned (VSP) trellis.

In 2006, average yield for the block, after conversion to a cane-pruned Scott Henry trellis with Macias 12 input, was 5.8 tons per acre. It averaged 25.5° Brix with 0.80 TA and 3.42 pH.

Grape quality has improved significantly at Green Valley Vineyard. The VSP trellis was mechanically-harvested. Now, with the Scott Henry

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Macias indicates location of a cracked cane.

trellis, the grapes are hand-harvested and sold at a higher price-point.

Opatz contends there are many benefits with the use of a divided trellis, albeit the primary benefit of the Macias 12 input at this site, was the reduced Botrytis incidence in 2006, a difficult season for Botrytis in California.

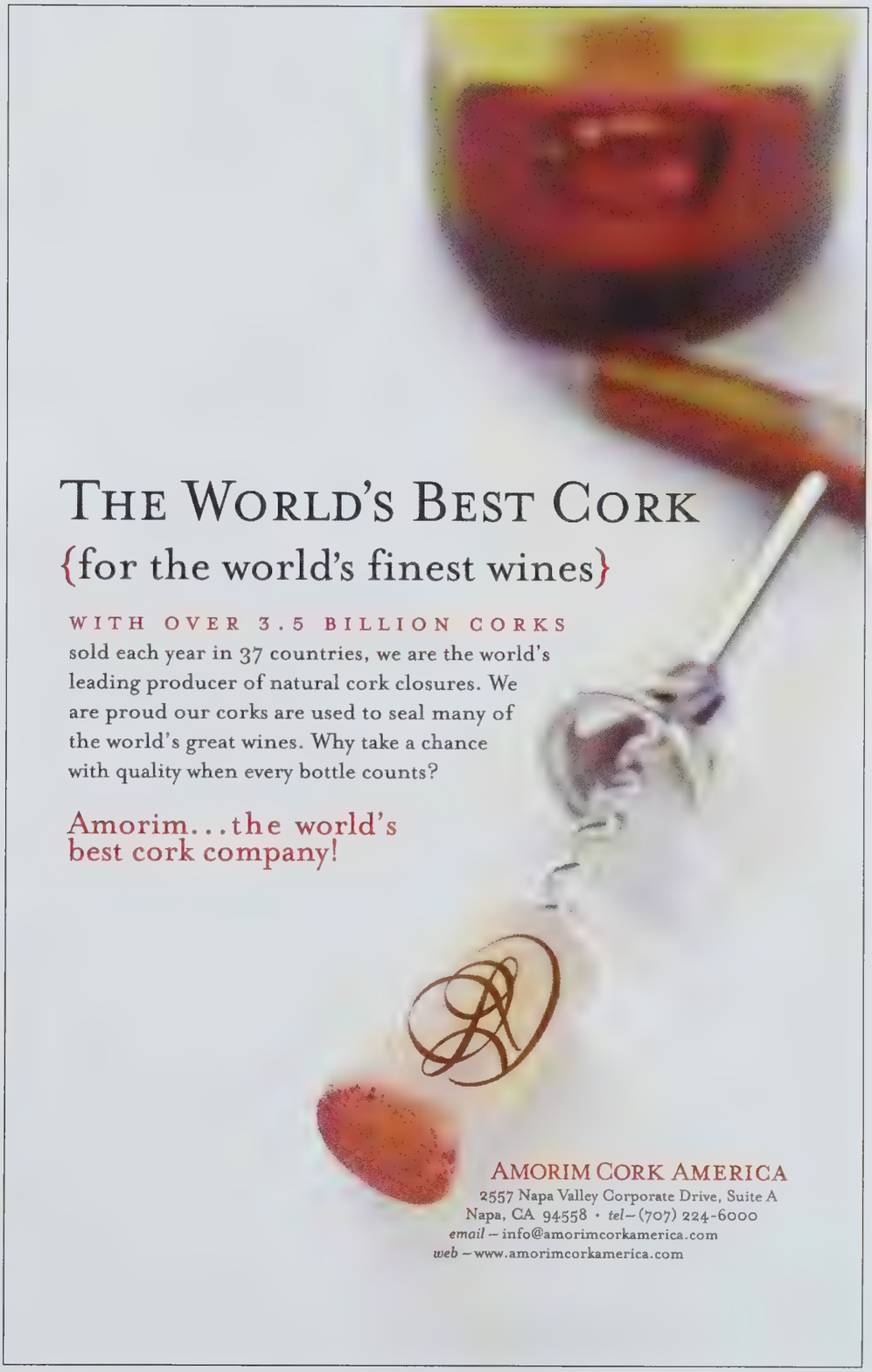
However, canopies such as the Scott Henry have been long known to reduce Botrytis incidence, so this benefit is primarily due to the Scott Henry system rather than to the method of downward shoot positioning. Other well-documented effects are less leaf density of the Scott Henry trellis allows more speckled sunlight on grapes, improved air flow that reduces prolonged dampness and creates an effective spray target resulting in improved coverage.

Close-up of cracked cane.

Time and motion studies

Macias provided data from several venues where he has performed the technique. Normally, four to five passes through a vineyard are required to manage the Scott Henry canopy. The first pass is to crack the canes, and this takes around 2.5 man-hours per acre — a relatively quick procedure.

The following three or four passes are to place shoots between the upper foliage wires and also to twist down the bottom cane. Note, however, that there is no need to tuck this shoot behind the wire in this modified system.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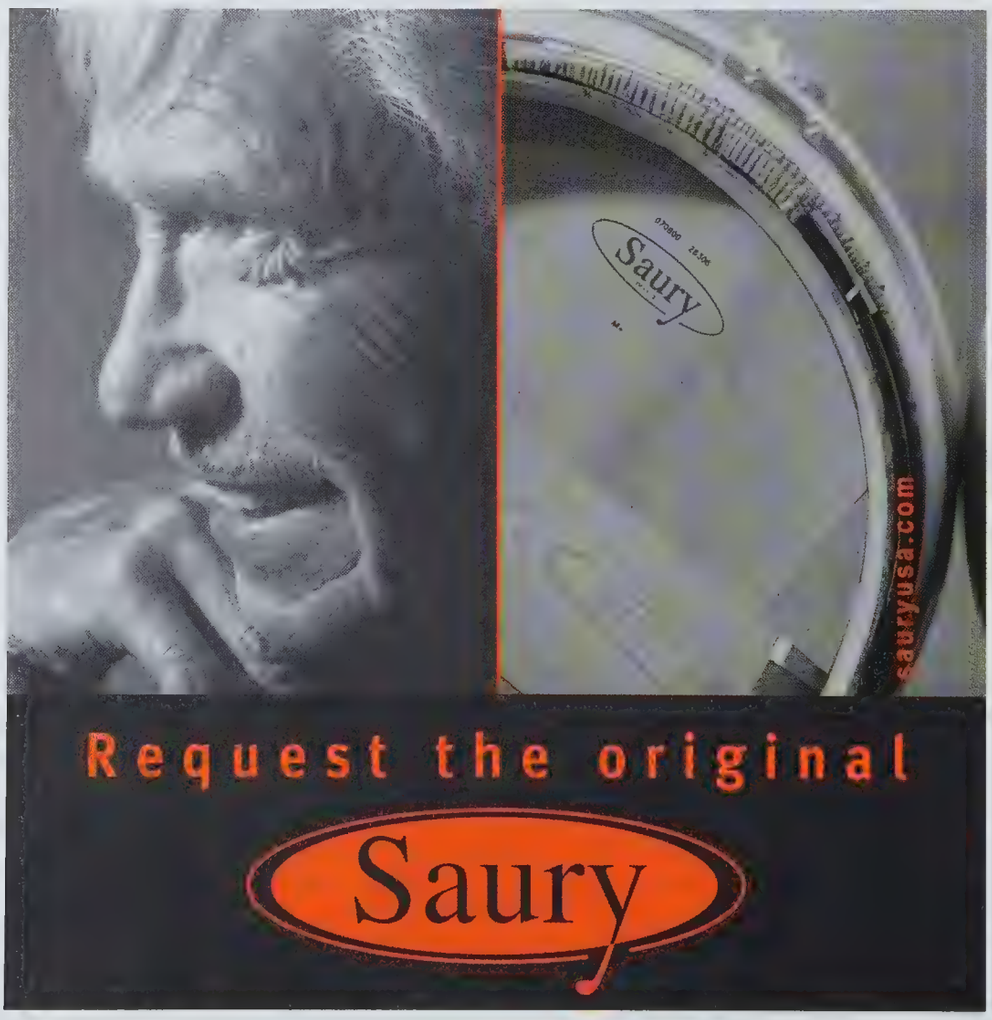

Total time required for cane-cracking and all foliage-manipulation averages around 12 hours per acre. This figure is virtually identical to the time we find is required for downward shoot positioning with one wire in Australia. Recent field studies at Tamar Ridge Estate in Tasmania, where Scott Henry is the principal training system, produced a similar figure. In fact, we will try the Macias 12 system at Tamar Ridge this coming growing season.

Conclusion

I am always interested to hear about development of new ideas to help make manual vineyard operations more efficient. The Macias 12 system seems to be a good idea. It eliminates the need for downward shoot-positioning wires and makes downward shoot-positioning much more efficient. This method may make it possible to institute downward shoot-positioning with varieties that could not be adapted to a Scott Henry trellis in the past.

Opatz and Macias have also had good experience with vertically-divided canopies in Alexander Valley, including both Scott Henry and Smart Dyson. At Hoot Owl Vineyards and elsewhere, their experience has been like mine. On high-vigor sites, vertical canopy division can be performed quickly and efficiently at minimal cost, and the benefits are economically significant, including increased yield, improved fruit composition, and less disease.

I am continually amazed to see so many vigorous vineyards trained to vertical shoot-positioning, a system that is not at all suited to a high-vigor site. I can only conclude that owners of such VSP-vineyards are wealthy people with money to waste.

Well done, Pete Opatz and Isaul Macias! Thank you for sharing the Macias 12 system with ***PWV*** readers! ■

Dr. Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Launceston, Tasmania, in Australia. He can be contacted by e-mail: vinedoctor@compuserve.com. Read about Dr. Smart's business, including his consulting schedule, educational wine tours, and seminars, at his home page http://www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/ 838-6312 and http://www.vinquiry.com.

BURGUNDY AND OREGON

TWO GENERATIONS MAKING *Drouhin Pinot Noir*

BY Condé Cox

Domaine Drouhin Oregon in Dundee, OR and Maison Joseph Drouhin in Beaune, France, Pinot Noir growers and producers, are owned by the Drouhin family. Third generation patriarch Robert Drouhin has spent a lifetime as the "guardian of the Drouhin house style," a role that he is now relinquishing to his daughter, Veronique Drouhin-Boss.

Founded in the 19th century by Robert's grandfather, Maison Joseph Drouhin (MJD) produces red and white wines from dozens of Burgundy vineyards, including family-owned parcels of Grand Cru and Premier Cru vineyards in the Cote de Nuits, the Cote de Beaune, and Chablis, including Griotte-Chambertin, Le Musigny, and Les Clos. Perhaps the best known MJD wine is the Premier Cru Beaune "Clos des Mouches" from which white and red wines have been made entirely from Chardonnay and Pinot Noir grapes for hundreds of years.

Domaine Drouhin Oregon (DDO) is the Drouhin family's first and only winemaking venture in the New World, and Veronique Drouhin-Boss has been in charge of winemaking at DDO since the first vintage in 1988, when she was 25. The gravity-fed winery and 90 densely planted acres (3,100 vines per acre) of mostly Pinot Noir are located in the Oregon Dundee Hills AVA (a sub-appellation of the Willamette Valley AVA), southwest of Portland, OR.

Annual production at DDO is 13,000 cases of Pinot Noir and 2,200 cases of Chardonnay. DDO sells an estate Pinot Noir, and two superior barrel-selection Pinot Noir bottlings labeled "Laurene" and "Louise," after Veronique's two daughters, and a Chardonnay called "Arthur," after Veronique's son.

Condé Cox and his French hosts spent an afternoon talking about the challenges, the differences, and the similarities of making wine in Oregon and in France.

Q. (Condé Cox) What do you do in winemaking that allows wine drinkers to recognize the unmistakable Drouhin house style, whether the wine is made in Oregon or Beaune?

Veronique Drouhin-Boss (VDB): The vineyard management of my father and my brother and the yield and winemaking in Oregon are very similar to Beaune. We try not to deviate from our philosophy of not overworking the grapes. We do punching down and pumping over — but not a lot.

Domaine Drouhin Oregon in the Oregon Dundee Hills AVA (sub-appellation of the Willamette Valley AVA).

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Robert Drouhin discusses grape maturity.

We do maceration after primary fermentation to gain additional extraction, but we do not touch the pomace [to avoid risking astringent flavors].

We use a very moderate level of oak [three-year air-dried staves before custom barrel construction and a limited amount of new oak barrels] and sometimes use fining to fine-tune the finished wine. We do it or don't do it — there is no rule. Some years we do not do any, as in 2004, for example. All these little details sum up the wine style.

Taste is very important. We taste the wine frequently. In Burgundy, when I get samples from Oregon, I taste with my father to make sure that we do not go too far from what we think Pinot Noir should be.

The challenge here [in Oregon] has been to make an elegant Pinot Noir. The challenge in Burgundy is to get healthy fruit with no rot and not be forced to pick early because rot has occurred.

Style is important to us. It is very important that we do not follow the trends of over-extraction, of [dry ice-assisted, extended pre-fermentation] maceration, of dark color. If the color comes naturally from the grapes, fine; if not, that is fine, too.

We do not add enzymes. Using all of the different chemicals that you can add today may work, but it does not necessarily add to the finished product quality. You get more tannins and more color, but is the wine better?

Q. Currently, there is more bottling of single vineyard sources of Oregon Pinot Noir, produced by such Oregon winemakers as Ken Wright [Ken Wright Cellars in Carlton, OR] and Patty Green [Patricia Green Cellars, in Newberg, OR]. Is this the beginning of more recognition of the differences in sites in Oregon?

VDB: I don't select a specific block to be the Estate or Laurene or Louise [the three separately labeled DDO Pinot noir bottlings]. I allow myself to be free to choose from the estate the elements that I feel fit the style that I want to see in the wine.

With barrel selection or block selection and 32 fermenters, I will have 32 different wines — not a big difference, but sometimes. I prefer to allow myself to take the best or the

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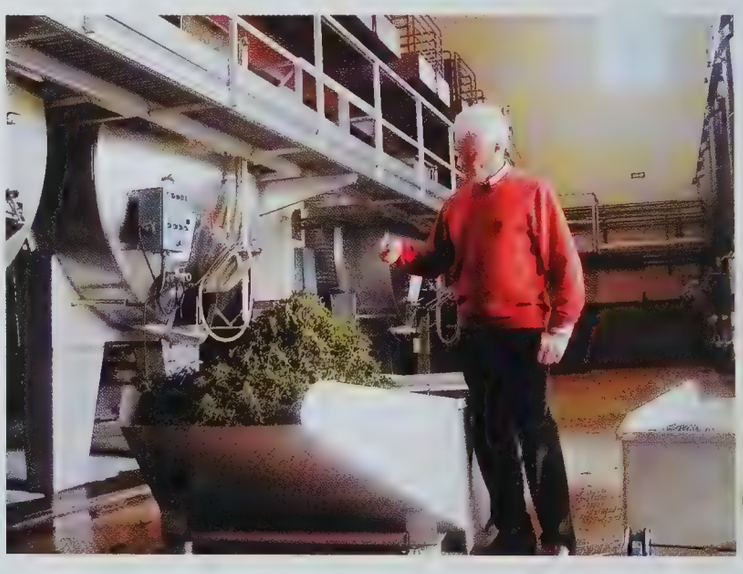
Veronique Drouhin-Boss indicates Pinot Noir fruit before harvest.

most interesting or the most complex or most age-worthy lots and blend them, rather than say that one particular block in the estate is the best one to use.

Q. Do you think that Americans have done enough in respecting the role of soil on wine quality?

VDB: It takes a long time to know exactly what you have. If two years in a row, the wine is superb from a particular wine block, is it because the clonal selection is very good? Or is it



Robert Drouhin examines green stems after destemming in fermentor room.

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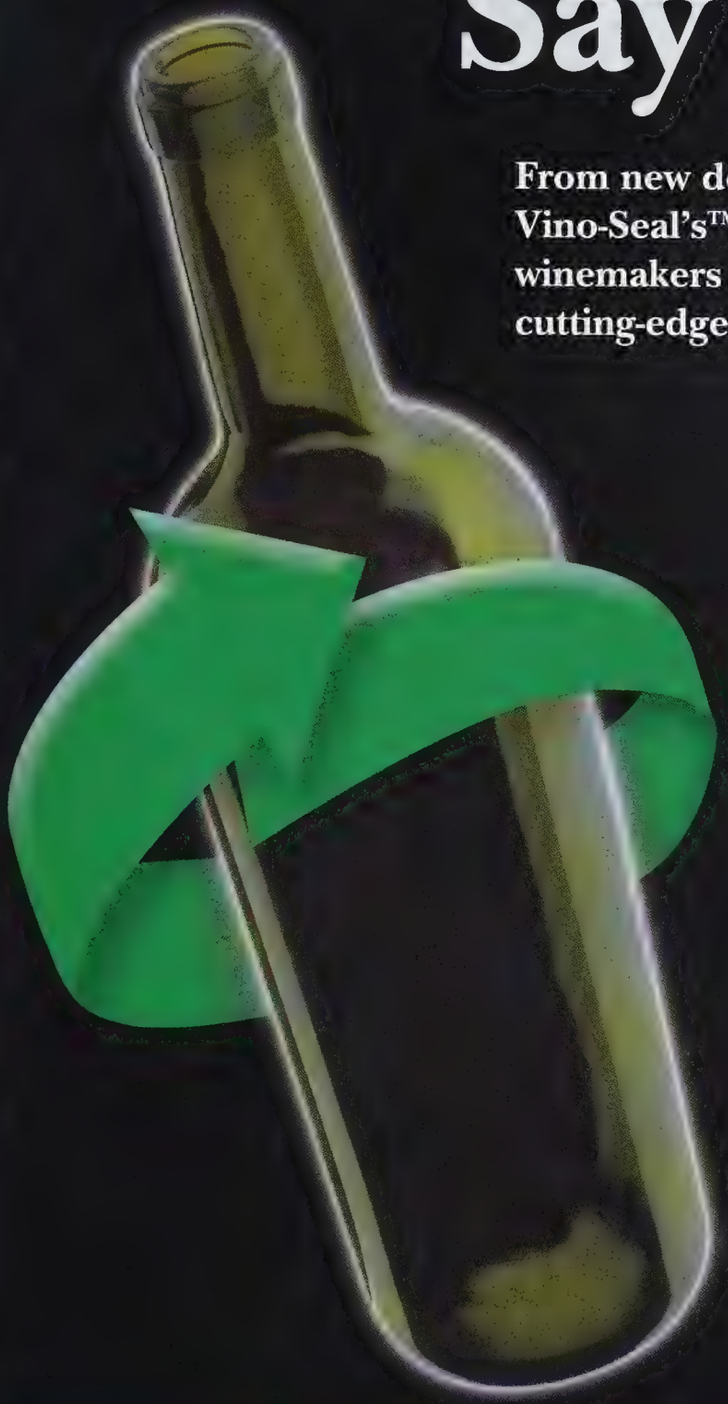

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because the clone on a particular rootstock combined with the rain that we got was perfect? Or is it because the roots are going deeper because the vines are older?

All of these questions will disappear when the vines get older and you can consistently compare warm vintages with cool vintages, early with late harvest. If there is a consistently good wine then, yes, you can say the soil is more expressive. It is not a question of doing enough research on soil, it is just a question of time.

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Q. According to the soil maps, the soil at DDO is mostly Jory, a basalt subsoil. In Burgundy, Pinot Noir is planted on limestone and Gamay is planted on granitic soil. How would you compare this to the soil and conditions in Oregon?

VDB: Oregon soil and conditions are totally different. This was the big surprise to us when we tried to develop wines in Oregon with the idea that we wanted a wine with finesse that was not coming from oak. We were very surprised to see how elegant these wines could be where the soils are so different.

There must be something in the soil that we do not know well yet that makes the Pinot Noir express this very refined thing it has. I think that the Dundee Hills [a new AVA as of March, 2005] is recognized as one of the areas that produces wines that are not big structured.

Because I buy grapes from other vineyards, I see the difference. I see good growers with a very good philosophy of managing their vineyards and all things equal regarding yield, and yet, the wines from their grapes are different.

Q. How have you managed to translate and maintain the Drouhin house style — an elegant style — from France to Oregon?

VDB: They are not exactly the same. I think that, generally speaking, Oregon wines have maybe a little bit more color than Burgundy. We don't do things differently, but the color just comes a little more easily in Oregon. It may be because of the soils here, or maybe because of the weather; in July and August there are more clouds and rain in Burgundy than in Oregon. Maybe the skins get more sunshine, which builds more anthocyanins and gives more color.

Oregon Pinot Noirs tend to be a little bit more spicy but of course, Vosne Romanee [in Burgundy] can have this spiciness. It is not exactly the same, but we try to have a similar style. I think if we were making wine in California, we would still try to work with the grapes we get to create a more elegant style instead of something more powerful.

Q. David Lett [owner of The Eyrie Vineyards and the first to plant Pinot Noir and Pinot Gris in Oregon] once told me that color and quality are inversely proportional in Pinot Noir wines. How do you react to that statement?

VDB: One time, when I was giving a tasting, David asked me, "How do you make this wine so that you can see through the glass? It is so beautiful." I replied that I did not do anything, it just happened. I took it as a compliment. Usually with Merlot and Cabernet Sauvignon, you cannot see through the glass, but sometimes with Pinot Noir, you can.

What David meant is that if you try to get too much color, you lose finesse — the more extraction you try to get, the less finesse you will have. Pinot Noir is not a very dark grape variety and not a very tannic grape variety. We think that, when you over-extract, it is at the expense of finesse.

Our wine barrels also contribute to the wine's elegant style. Once, there was a shortage of barrels that resulted in the coopers selling us some wood that was not perfectly dry. It gave some bitterness to the wines. It is a shame to do all this work

and then get that kind of barrel, so we started our [in-house, three-year air-dried staves] custom barrel program. I am very lucky here [at DDO] that I get to participate in that.

[Robert Drouhin joined the discussion with his perspective on the *terroir*-driven theme of how all wines are inextricably bound up with their place of origin. He discussed what it means to make Pinot Noir in New World Oregon, where the Pinot winemaking industry, although now exactly 40 years old, is immature and undeveloped compared to the industry in Burgundy, where his family's holdings include ancient Grand Cru vineyards, such as Chambertin Clos de Beze, Le Musigny, and Chablis Les Clos.]

Robert Drouhin (RD): Our knowledge [as producers and sellers of a wide range of Pinot Noir and Chardonnay] and our vision of wine attaches to the grape variety. Not just the grape variety, but grape texture and color. In some ways, growing winegrapes is easier in Oregon, in other ways, [growing and making Pinot Noir] is more formidable than in Burgundy.

I find that Oregon grapes generally have fairly thick skins. They have a lot of color. The wines naturally have a lot of texture and fruitiness — what we describe as raspberry, strawberry, cherries, and so on.

For the wines to be very fruity, but on the other hand, to also have the complexity and the finesse, this is formidable. It probably has to do with the terroir. In Burgundy, we have the terroir, and we have the finesse, but very often, the grapes are not as ripe as they should be. Maybe rot develops more easily there or the skins are more fragile.

To have as much finesse as possible with real Pinot Noir taste is a challenge — in both places.

Q. Perhaps this distinction between the search for differences and for sameness is reminiscent of the distinctions between French winemaking and American winemaking generally.

RD: It makes it more interesting to have differences from one wine to another. I know from a marketing point of view, however, marketing managers would not like this remark. They like consistency in price, availability, and wine style.

Q. Can you share your thoughts and experiences from both France and Oregon, about the significance of handing off responsibilities to your children?

RD: First of all, we have the experience with our French firm [Maison] Joseph Drouhin, which is like the experiences of others in all of France and Europe. They had a lot of experience which they had gathered from previous generations, but they had very little scientific knowledge. Although recently there are many changes, with the addition of oenologists, technical engineers, new tools, temperature controls, and so on.

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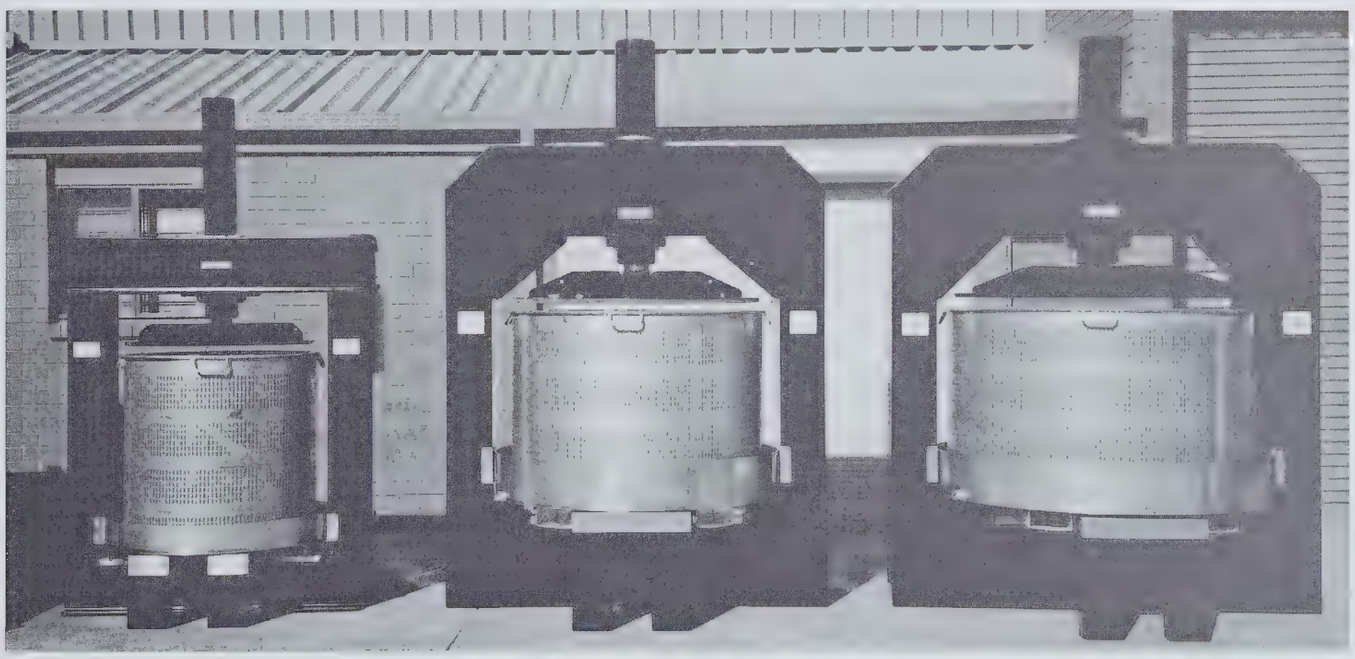

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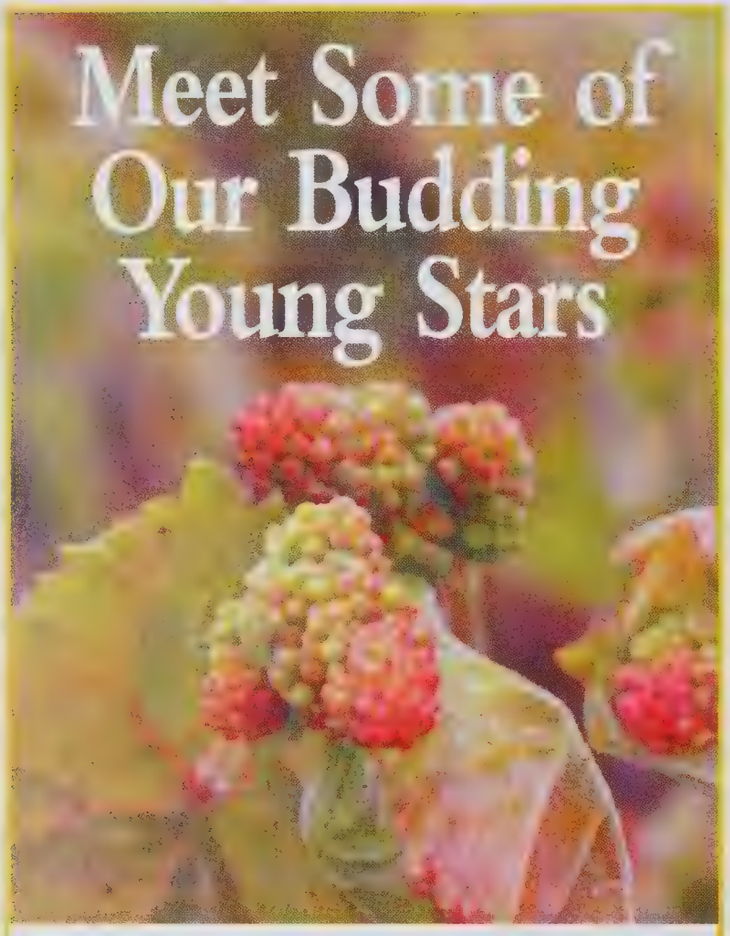

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"We use a limited amount of custom new oak barrels," explains Veronique Drouhin-Boss.

The old generation — my generation — used all these new tools [such as temperature-controlled fermenters, formally trained staff oenologists, bladder presses instead of basket presses, etc.].

Sometimes, we were so enthusiastic about these new tools that we adopted them, and it took us a decade or so to realize that we had gone too far. Since we still had in our memories the Burgundies [that our families] produced 30 to 40 years ago, we realized that, with all these new tools, we were going backwards. We stopped adding fertilizers; we have become more cautious with malolactic fermentation, and so on.

Now, the new generation has all this scientific knowledge. They have the same passion — and that is very very important. In fact, sometimes, I think that they are even more passionate than my generation. And they have an advantage: they travel and exchange ideas.

Those living in the Cote de Beaune now go to the Cote de Nuits to taste in the cellars! [Robert was now laughing, because it is only 10 miles from the town of Beaune in the heart of the Cote de Beaune to the town of Nuits St. Georges, in the heart of the Cote de Nuits, although the two regions are sometimes considered by the locals almost as two different countries.] They love to come to the U.S., where the mental attitude is positive.

However, because they have technical knowledge, they are a little reluctant to go "backwards," and they are buried a little too much in science. This is why it is very important for fathers to say to their children, for me, to say to Veronique, for any grower, to say, "Look, it is not as simple as that. It is not black and white. Yes, you have good knowledge, continue experimenting, but be cautious."

It is difficult in Oregon. We do our analysis. We analyze the type of color, the intensity of the hue, and so on. We test the polyphenolic content. It is all terribly interesting, but if we determine the vinification just by looking at this analysis alone, we would be making a huge mistake.

I think that the younger generation realizes now that tasting is a key factor to quality. You need some knowledge, you need passion, you need to do a lot of work, and you need to pay attention to all details.

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When I think of Oregon in 1988 [the first vintage produced at DDO, with purchased grapes], most wines were technically very poor, but behind these technical defects was the taste of potential quality and the finesse, and this is why it has changed considerably in 15 years. Now, the wines are both technically good and have finesse.

It is really a fascinating period now. I happened to be very young, 23, when I took charge of Maison Joseph Drouhin [by reason of his parents' death and by reason of a stroke suffered by his uncle Maurice Drouhin, who had adopted Robert and his siblings], and it was a similarly fascinating period then.

I did not have oenological knowledge. A good friend of my father's helped me. We made big changes then, in 1957, from horses to tractors and from manure to fertilizers. That's when agricultural engineers appeared and oenologists — the winemaking diploma was created in 1955 — so big changes.

Now is another period of change, because of all these oenologists and the exchange of knowledge, we are beginning another new era. There is now enough knowledge in oenology, in science.

When I am in Beaune, every day I am in the tasting room [in the winery, part of the laboratory]. I am the guardian of the style of Joseph Drouhin. I am in the winery because it is my passion, but at 73 years of age, I am not involved in the day-to-day operation.

Veronique is not [formally] involved in the winemaking [at Maison Joseph Drouhin in Beaune], but she participates in all the tastings. Her role in the future, although she is a [university-trained] oenologist, will be to become the guardian of the ethic of the company and of the style, to make sure that we progress but at the same time that we do not bow to fashion.

Q. How do you believe that you have been the guardian, in specific terms, of the Drouhin house style, between so many different terroirs? Even within Burgundy, there is a noticeable Drouhin house style between the different terroirs. There is a noticeable house style even between the wines made in France and at DDO. Is it something about viticultural practices or vinification methods?

RD: I am certainly not the best judge of the Drouhin style. I learned our style from my father, and I consistently learned about the wines of Burgundy and the differences between the villages, all the while consistently tasting — tasting old wines, tasting young wines — discussing with other growers not only our own wines but theirs, too.

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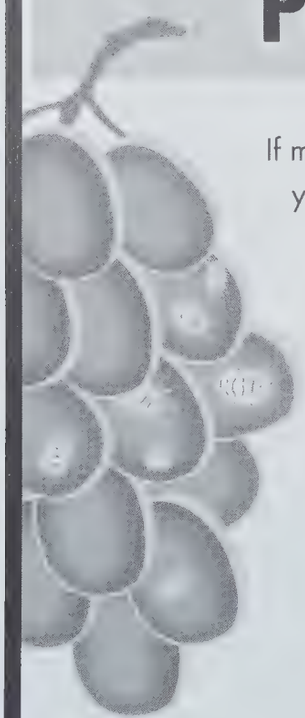

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We would discuss how one part of a hill is a little more chalky, and how that affects the wine. I think of Corton Chalemagne, for example, on the Pernand side. [Pernand-Vergelesses is a tiny hamlet which sits on the northwest side of the famous hill of Corton, where both Chardonnay and Pinot noir vines have been grown for centuries]. It is drier, it takes longer for the wine to age. If you move to the south, the soil has more clay and the wine is rounder; it ages more quickly and may not have the same elegance, so we would have these discussions every day.

Then there are my own tastes. I very much like classical music; I like some modern songs, but not all of them. There is a certain way of life, a certain way to dress, so I probably project my own taste in the wines.

I was taught by my [uncle and adoptive father Maurice] that Drouhin wines tend to the light and elegant side, typical not only of Pinot Noir but of the villages. The Drouhin wines can age extremely well. They develop with time. Only yesterday, we had a Cote de Beaune 1995, a modest wine, which at 10 years old was perfect at lunch. The wine had elegance.

As a family we very often have meals together. We have a certain combination of food and wine, and our children are educated in this manner.

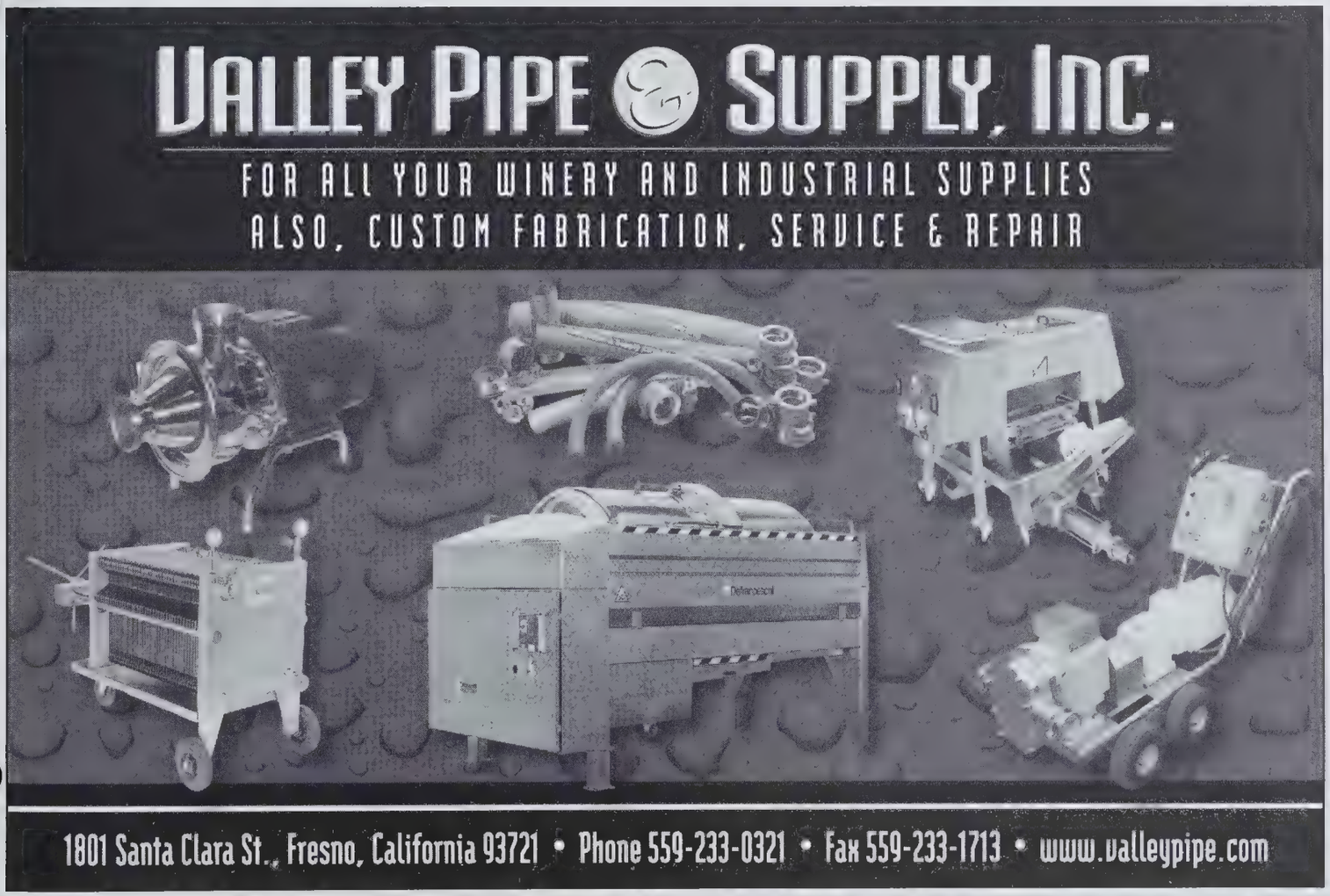
Q. I asked Veronique earlier what it is that has allowed you to maintain and to carry from France to Oregon the "Drouhin house style." Is there something in particular that you have done that has allowed you to do that?

RD: We are not trying to produce big, full-bodied, powerful wines. We want the wines to have ageing potential. When we ferment, we do not try to extract the maximum! Maybe we ferment a slightly shorter time. Our wines should not be too rich, too oaky.

It is somewhat easier to describe what we do not like. It is more difficult to describe the nuances of what we are trying to achieve. When we make a Chambolle Musigny, we don't try to make a Chambertin. In other words, we try to retain raspberry fruitiness, all the softness and charm that Chambolle-Musigny wines have.

Sometimes the marketing is taken into consideration, in that we have to think of the circumstances of when the wine will be consumed. Consider Chorey-les-Beaune and Beaune, two neighboring villages. Beaune naturally has more body, more complexity. Chorey is a softer wine, produced down the valley, and it ages more quickly.

When we make Chorey, we know that the wine will be sold fairly young. We know, generally, consumers will not keep Chorey-les-Beaune for 10 or 15 years. We try and produce a soft wine which can be presented young.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On the other hand, with a Beaune Premier Cru, we would keep it longer in the fermenter, we may retain stems; we do not mind if such a wine is not all that pleasant when it is young, because we want the wine to taste really good when it is 10 or 15 years old. Naturally, by doing so, we know that eight or nine bottles [from every case sold, on average] of our Beaune Premier Cru [such as Clos des Mouches] will be drunk too young and not always appreciated. But it is the bottle here or there in the world that is drunk at the right time that maintains our reputation.

Q. You mentioned leaving the stems on the clusters in the fermenter for some of your Burgundy wines, but not for others. Do you typically use this same whole cluster/destemming regime for your Oregon wines?

VDB: We do more destemming in Oregon. Almost everything is fully destemmed at DDO. In Burgundy, almost nothing is fully destemmed.

Q. What is the reason behind this distinction?

VDB: We believe that the vines keep growing here [in Oregon] for a longer time. In Burgundy, they shut down and stop growing sooner than they do here, so the stems are riper in Burgundy. If you chew a stem here, it is not very pleasant; if you chew a stem in Burgundy, it is not very pleasant either, but it is better. We have tried here at DDO to retain some stems, but the result is a greenness that never goes away.

RD: The foliage is still green when we harvest grapes in Oregon. In Burgundy, when we harvest grapes, the leaves have turned yellow. The physiological cycle [of the vine] comes to an end in Burgundy when we are harvesting. It is not completed here [in Oregon] at harvest. Here, the stems are still green — not really green, but not very brown. That makes a difference and that is why we are very careful in selection of rootstocks [for our vineyard at DDO].

We have tried to find rootstocks where the vines could suffer a little. If you go through our vineyards, some are already turning somewhat yellow [on October 10, 2005]. In the beginning at DDO, we used only 3309 rootstock; later on we selected Riparia, which ripens more quickly. We also selected a difficult rootstock called 1616.

Q. Do you crush the berries or open up the rollers on the de-stemmer to get whole berries?

VDB: On our de-stemmer, we removed the crusher in 1989 [at DDO].

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RD: In Beaune, grapes are not crushed. Fermentation within the berries seems to bring more finesse, more complexity.

VDB: But you get plenty of broken berries anyway just going through the de-stemmer.

[Robert then led us from the winery into the vineyard to demonstrate the effects on reduced vine vigor caused by dense vine spacing and use of different rootstocks.]

RD: The influence of vigor is related to the territory that the vine can explore. If you look at the vines — here at the end of a vine row — they have plenty of earth. See how vigorous and green they are at the end of each vine row.

On the other hand, if you move further down to the middle of a vine row, there are many yellow leaves, because there is more competition. Here is 1616 rootstock and yellow leaves in a more closely spaced part of vineyard. The more the root system develops here, the more it is in competition, and then the roots have to go deeper into the ground.... The soil depth varies here.

The soil is very shallow in Burgundy. It takes a long time there for the roots to go deep. Gradually [in Burgundy], the roots go through cracks way, further down. Look here [in the DDO estate vineyard] at how green the foliage is [on October 10] and at the vigor. Here [cutting off a cluster from a vine], the stem is green.

Q. Have you searched elsewhere in this region for shallower soil sites, so that the ripening of the grapes coincide with lignification?

RD: It is a combination of climate and the richness of the soil. Quite frankly, if I had looked only at the soil here in Oregon for planting vineyards, I would have thought, no. I would have thought that it is not possible to produce good wine here.

It came as a great surprise [in much-publicized blind tastings in France in the 1970s] to taste David Lett's wines — in a word, typical Pinot Noir with a lot of complexity, finesse, and ageing potential. It came as a big surprise. I do not have the answer.

We prefer the soils to be stony. We like soils to have a high pH. [No exact pH level mentioned by Robert.] It is just the opposite here [in Oregon]. Yet, the result is that we have good wine, and typical Pinot Noir, though slightly different, yes.

It is true that we still have a lot to learn. One should not manipulate the viticulture. The moment you have supple-

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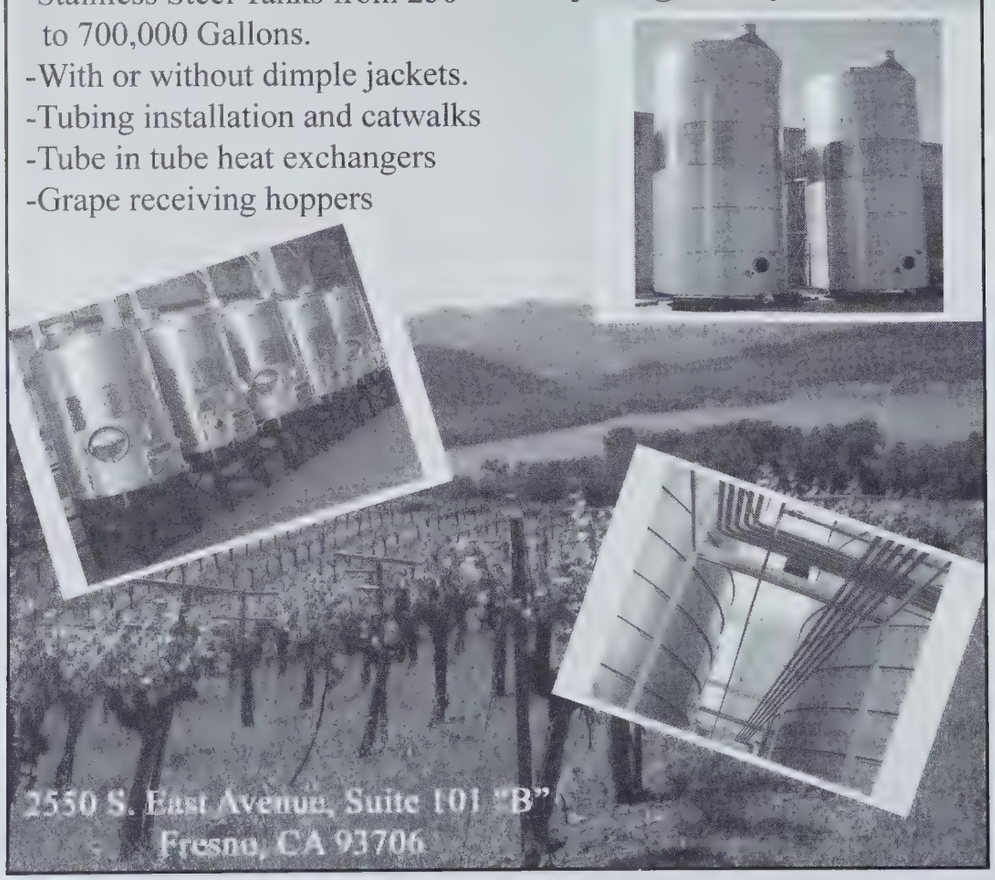
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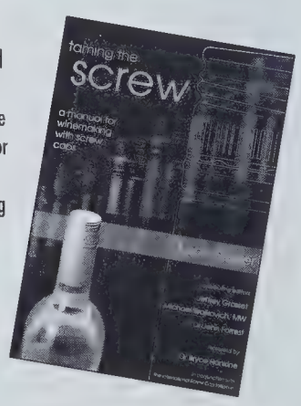

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mental irrigation, you can inject nutrients to help vine growth. That would be a terrible mistake in my opinion.

Q. Has this been a fun family project for you and Veronique and Francoise [Robert's wife and Veronique's mother]? [DDO general manager David Millman mentioned that Francoise works sometimes in the DDO laboratory, and that this is "not something that she would do in Beaune."]

RD: Ahhhh, yes! It started in various phases. Without Veronique, we would never have done it. First of all, without Veronique I would not have come here in 1987 to see David Lett. [Veronique worked as a harvest intern, during the summer and autumn of 1986, when she was in her early 20s, at Lett's The Eyrie Vineyard, Oregon's oldest producer of Pinot Noir and Pinot Gris, and also at nearby Adelsheim Vineyard and Bethel Heights Vineyard & Winery, which later became the source of grapes for the 1988 DDO wine, prior to the maturation of the DDO estate vineyard.]

The key to success — a bit of a gamble — was the quality. I did not have the experience of David Lett in the Dundee Hills. [Lett's original Eyrie Vineyard is located very near to DDO's vineyard, at a slightly lower elevation.]

But then you also need quality vinification, and Veronique is a great asset in this regard.

You also need distribution. Without a market, you cannot make wine.

Author's Postscript:

I first tasted Pinot Noir made at Domaine Drouhin Oregon in 1992. The small tasting group included, among others, the late André Tchelistcheff, and Robert Drouhin himself presided over the tasting. The wine was from the 1990 vintage, and all the glasses had been poured prior to arrival of the guests. Because of the wines' uncanny resemblance not only to Pinot Noir from Burgundy but also to Maison Joseph Drouhin wines specifically, I surmised, at the time, that Robert had made surreptitious arrangements to fly in a full barrel from the Cote de Nuits which he had used for this tasting! This was of course not the case, as the wines were from the initial DDO estate vineyard crop vinified at DDO by Veronique.

Fourteen years later, DDO Pinot Noir wines continue to amaze me, not only with delicate aroma, pure fruit flavor, and delicate texture, but also with a striking similarity to their "cousins" produced by the Drouhin family in Beaune. Sometimes, the influence of "the hand" is just as apparent as the influence of "the land." ■

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Two male and one female juvenile New Zealand falcons, introduced into a Marlborough vineyard, use vineyard posts as hunting perches.

Wild falcons rule pest birds

No matter how well-secured nets are, birds still get inside — often making entry holes themselves. Blackbirds will pluck whole grapes.

BY Valerie Saxton,
Centre for Viticulture & Oenology,
Lincoln University, New Zealand

Grapes are damaged by pest birds, while the New Zealand native falcon is a threatened species. An innovative approach aims to solve both problems together in a sustainable and long-term way.

As in many grape growing regions of the world, populations of birds that damage grapes are a problem in New Zealand vineyard areas. The greatest problems are with introduced European starlings, blackbirds, and thrushes.

These European birds were introduced by pioneers in the 1860s, in conjunction with agriculture, often as a predator for grassgrub and snails. Their population expansion with intensive horticulture is logical, and there is no more intensive operation than in the grape growing region of Marlborough on South Island.

These birds eat other foods at other times of year — why do they suddenly start eating grapes? Why does the eating intensify closer to harvest? The obvious answers are that as sugar increases, so does the attractiveness of the grapes, and that the birds attract more birds.

But there is more to it than that. These natives of northern Europe focus on a fruit diet in preparation for winter. The reason is that fruit is **not** nutritious as a diet, and after about eight days, when it reaches near-starvation, a bird's metabolism slows. At the same time, extreme hunger sets in and binging on fruit sugars (and if available, lipids or fat) contributes to a sudden increase of body fat to prepare for winter. This explains the exponential increase in damage to grapes over time as winter approaches. This process has

With six weeks to go before harvest — these grapes that small silvereyes have pecked already have suffered damage from various rots.

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been demonstrated for migrating birds also.

There is another pest bird that is a different story — the silvereye, a small (12cm) passerine native to Australia. It arrived from Australia in the mid-1800s. Unlike European birds, it is not programmed for approaching winter. These birds' normal diet is nectar, fruit, and invertebrates. They fly in small flocks and arrive in vineyards as the weather cools in the hills.

Silvereyes are partially protected by law, but landowners are allowed to control them when damage occurs to crops. The underlying reason why they are so attracted to grapes is as yet unknown, but they can actually squeeze through the mesh of protective nets, so are a persistent and consistent problem throughout Marlborough vineyards.

A large proportion of Marlborough's 11,000 hectares of vineyards are netted, yet damage persists.

Up in the nearby mountains, the native New Zealand falcon is a threatened species. A relatively small bird as raptors go (about the size of a racing pigeon), falcons tend to nest on rocky outcrop ledges or even on the ground, so their nests are easily preyed upon by rats and cats.

In addition, due to recent droughts their food substrate — small mice and birds — has been in short supply. Their numbers are dwindling to the point where the survival of the species is of concern, but as conservation dollars are earmarked for the most endangered species there is no official funding available to help in conservation of the falcons.

Dr. Nick Fox of International Wildlife Consultants is British and based in Wales. He was in New Zealand in the 1970s doing a PhD thesis on the New Zealand falcon at the University of Canterbury in Christchurch. Some of his research was done in the Waihopai Valley in Marlborough.

On a recent return visit, Fox was astounded at the expansion of the vineyard areas in eastern regions of the South Island, close to the habitats of the falcon. Inquiries led to contact with researchers in viticulture and in

A female New Zealand falcon with prey species — an introduced European blackbird.

bird management at Lincoln University in Canterbury, and with the Marlborough Wine Research Centre in Blenheim. Connections were made, and before long a plan took shape.

The relative failure of bird-scaring devices such as gas cannons, kites, scarecrows, and even of shooting patrols is generally attributed to *habituation*, a learning process by which the birds learn that not responding is not unsafe, so they slowly fail to respond. What is missing is the reinforcement of a real danger. This is where the falcons come in.

The hope is that the very real and evolutionarily reinforced nature of danger from a naturally occurring raptor will increase the birds' risk perception and encourage them to avoid a dangerous situation and fly off elsewhere. As the pest birds' risk perception increases, scaring options would become more effective, reducing the need for the very expensive and labor-intensive netting.

Now in its second year, the project — funded by New Zealand Winegrowers and the Sustainable Farming Fund, and supported by the Department of Conservation — has succeeded in translocating four falcon fledglings into artificial nests.

The nests are in mussel barrels (a by-product of mussel farming in the Marlborough Sounds), which are approximately 1.5m long and 0.75m wide, and in which rocks and gravel are put to emulate a desirable nesting site. Hung in a large shady tree such as a pine, these are predator-safe. Falcons are "nest-imprinted" while young, which means they will seek a similar site for nesting when breeding as an adult. Colin Wynn, who has helped Fox on other international raptor establishment programs, such as the "Save the Saker" in Mongolia, is the local manager.

The first two female birds have been slowly expanding their range from the edge of the forest into nearby vineyards. The second nest, settled by two males, is in a large pine tree on the border of two large vineyards.

Falcons have been seen flying up and down the rows in the vineyards, though they have every option to take off into the mountains. They have also been seen with wild falcons, so there is hope that the females may mate with a mountain-based bird. Females are ready for mating a year earlier than males.

Each falcon has a harness with a radio-tracking device to monitor its movements, and this year the hope is to monitor the falcons' movements in vineyards. As winter ended, unfortunately, one female was killed by a wild cat — quite a setback. An encouraging sign however was that the remaining female was already copulating with a one-year-old male – an occurrence not known in the wild population.

As spring arrived for the 2006/2007 growing season, the program geared up again. Fox arrived from the United Kingdom and Wynn and volunteers were planning trips into the mountains to look for nests and identify those with sufficient nestlings where one could be removed. It is hard work climbing over the rugged terrain; luckily there are enough passionate ecologists and mountain men around for the plan to be feasible.

The vineyard environment suits the falcons' agility in flight. They relish open space, and are skilled at flipping over and under trellis wires. They will pursue up to 20 birds per day, but will only kill two out of the 20. While they

are young, and during most of the year, they are fed by vineyard staff on reject day-old cock chicks. In due course, feeding will be limited — in the grape ripening season only — to encourage more pursuit of the birds in vineyards (which are almost exclusively pest birds at this season, and not other species).

The falcon is a proud, attractive bird, a national emblem (on the $20 bill) and this project is of great interest in New Zealand. It is a long-term project and is closely monitored for its impact on grape damage. Assessments have already begun for sites that are likely to receive the next season's young birds. If damage is significantly reduced, falcons could be welcome and useful contributors to the vineyard staff at ripening time. Hopefully, visitors will enjoy the spectacle of a falcon in full flight while tasting wines at cellar doors. ■

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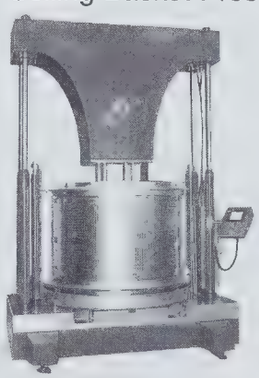
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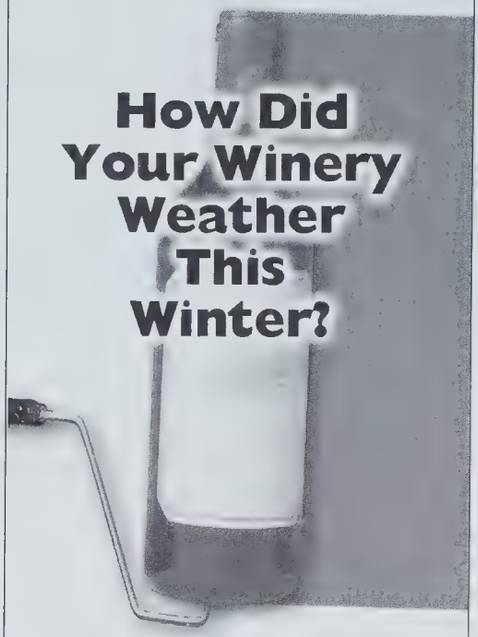
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Figure I: Rainfall simulator used in the field. Here the soil is wetting: Runoff is collected from the drain at the bottom of the frame.

Quantifying erosion rates for various vineyard management practices

BY Heather Shepherd, Wallace Group and Sonoma Ecology Center, Mark Grismer, Dept of LAWR, University of California, Davis With assistance from Amador County Wine Grape Growers Association

Much has been said on the topic of soil erosion and its prevention in vineyard management, yet while personal experiences and qualitative data may indicate what erosion looks like and where it occurs, little data has been collected to quantify rates of erosion resulting from land management practices.

While erosion seems to be a fairly straightforward process (high rainfall on bare soil on a hillside leads to erosion), the actual soil mechanisms that contribute to erosion potential are complex and not as straightforward as generally presumed. For example, one 15% slope may erode terribly while another does not.

To obtain more quantitative data, contribute to a more complete understanding of soil erosion processes, and build on the recent erosion control work of the Central Coast Vineyard Team (*PWV* Jan/Feb 2005), a two-year study was conducted by the Sonoma Ecology Center and the Amador County Wine Grape Growers Association. The study focused on the relative rates of erosion, including comparisons of soil properties such as water infiltration, time to runoff, runoff volume, and sediment loading, from various vineyard management practices in Amador County.

In the study, four types of land and vineyard management practices — no till, spring till, bare soils, and undisturbed soils — were investigated for their potential to erode, using rainfall simulation to provide constant and repeatable rainfall events. Included in the study were monitoring of stream water quality, pesticide and nutrient delivery, and school and community outreach; these elements of the study are to be reported on later.

Erosion

Erosion due to water influence occurs in two ways: splash erosion and overland flow. Splash erosion occurs due to the impact of raindrops on soil, which dislodges soil particles and makes them available for subsequent transport by runoff. By itself, splash erosion does not contribute large volumes to downslope transport of sediment.

However, when the rate of rainfall exceeds the infiltration rates of the soil, water accumulates on the soil surface

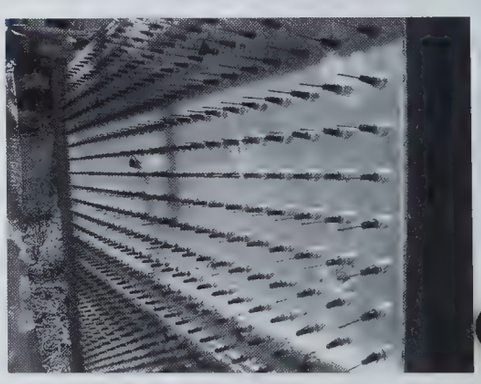

Figure II: The drop-former. Note all the needles.

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and a "sheet" or small "rill" forms and eventually runs off. This surface runoff, or overland flow, picks up soil particles and transports them downslope, causing erosion. The more energy associated with overland flow — whether the energy is due to steeper slopes, higher surface water flow rates, or both — the greater the erosion potential.

Surface roughness, in the form of soil cover like mulches, soil surface residues, and vegetation, reduces the energy (velocity) of overland flow, thus reducing erosion. Surface roughness also lessons the energy of raindrops, thus reducing splash erosion.

In addition, soil properties that increase infiltration rates reduce runoff volumes and associated erosion. Finally, techniques that dissipate runoff energy, such as terracing or installing water bars, reduce erosion by reducing runoff velocity (and possibly promoting infiltration).

The above information is fairly intuitive. As farmers, wine grape growers are familiar with their vineyard soils; they have likely noticed areas that erode and have possibly taken steps to reduce that erosion, such as seeding or using water bars. However, the devil is in the details.

Soil treatments

Dislodged soil particles are not only made available for transport, they also relocate and clog soil pores, reducing infiltration. The use of some treatment to protect the soil surface is therefore potentially beneficial in reducing erosion. Common approaches include covering the soil surface with mulch, netting, or living plants. This reduces raindrop impact, which in turn reduces surface disruption of the soil.

While mulching and netting can help protect soil in road cuts and other difficult situations, live vegetative cover is more practical in a vineyard. Further, living vegetation not only protects the soil surface, it has also been shown to improve infiltration through better soil structure and aggregation.

Vegetative cover, once established, does not usually have to be reinstalled year after year. What? No need to

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Table I: Site characteristics

Site	Soil type[1]	Slope (%)	Elevation (ft.)
1	bare	7	1572
2	bare	8	1567
3	bare	9	1594
4	bare	10	1552
5	bare	12	1504
6	bare	16	1512
7	bare	25	1520
8	sp till	7	1514
9	sp till	8	1091
10	sp till	9	1097
11	sp till	12	1054
12	sp till	15	1102
13	sp till	19	1831
14	sp till	20	1854
15	no till	9	1683
16	no till	9	1672
17	no till	10	1666
18	no till	13	1685
19	no till	14	1949
20	no till	15.5	1956
21	no till	16	1943
22	no till	21.5	1936
23	no till	22	1667
24	undist	28	1654
25	undist	31	1674
26	undist	33	1680
27	undist	34	1687

Soil types: bare = bare soil
sp till = spring till
no till = no till
undist = undisturbed

reseed? Depending on the primary purpose of the vegetation (this work does not address nutrient retention or encouragement of beneficial insects), it may be best to leave the soil alone.

Soil structure takes years to develop, and while tillage may well improve infiltration of rainfall, disrupting the soil structure may result in more sediment transport.

Rainfall simulation

Rainfall simulation studies provide a means to standardize the evaluation of erosion control measures through replicated rainfall events of the same intensity, or kinetic energy on multiple plots enabling statistical evaluation of treatment effects on hydrologic parameters of interest.

Rainfall intensity can vary from a fraction of an inch to over one inch per hour in a matter of minutes, or over distances of less than one mile. Rational comparisons of soil treatments from several plots require a repeatable and controllable approach.

The benefits of using rainfall simulation to examine soil runoff properties are repeatability and control of rainfall. (However, rainfall simulation is not a substitute for measurements of actual rainfall runoff and sediment transport over the course of a rain season.)

While erosion rates are typically expressed in tons of sediment per acre per year, rainfall simulation yields grams of sediment per liter of runoff, or per inches of rain. While, in theory,

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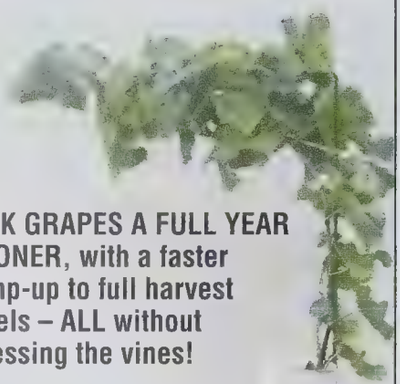

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Table II: Soils analysis

Site	pH	EC dS/cm	Ca (SP) mg/L	Mg (SP) mg/L	Na (SP) mg/L	Cl (SP) mg/L	HCO3 (SP) mg/L	CO3 (SP) mg/L	CEC[1]	OM[2]	Sand %	Silt %	Clay %
1	4.7	1.22	5.8	2.1	1	1	0.2	<0.1	7.1	1.88	NES	NES	NES
2	4.7	1.21	5.8	2	0.9	1	0.3	<0.1	7.3	1.88	NES	NES	NES
3	4.9	0.84	3.5	1.4	0.5	1.6	0.7	<0.1	7.2	2.09	56	32	12
4	6.2	0.76	3.5	1.5	0.4	1.4	2.1	<0.1	12.2	3.56	56	32	12
5	6.3	0.24	1.2	0.4	0.3	0.6	0.4	<0.1	16.2	3.49	58	28	14
6	5.4	0.38	1.7	0.9	0.3	0.6	0.6	<0.1	12.9	2.26	36	40	24
7	6.4	2.75	12.9	5.4	2.7	10.9	8.1	<0.1	14.9	4.71	52	36	12
8	5.2	1.18	6.9	1.9	0.5	0.5	0.3	<0.1	10.6	2.79	50	38	12
9	5.3	0.81	4.1	1.6	0.5	1.5	0.6	<0.1	7.9	2.79	62	28	10
10	5.8	0.98	5.9	1.9	0.4	3.1	2.2	<0.1	9.4	3.64	59	29	12
11	5.8	0.86	4.7	1.5	0.5	2.4	0.9	<0.1	8.6	1.95	60	28	12
12	5.8	0.85	4.7	1.5	0.5	2.4	NES	NES	9.1	1.91	NES	NES	NES
13	6	0.72	3.6	1	0.4	0.9	1.3	<0.1	10.7	2.36	58	29	13
14	6.1	1.01	8.2	1.6	0.3	1.7	4	<0.1	18.8	6.08	58	30	12
15	5.6	0.57	1.7	0.7	0.5	1.5	0.7	<0.1	9.7	3.64	59	29	12
16	5.8	1.65	4.3	2.5	0.8	1.9	1.9	<0.1	10.8	3.79	56	32	12
17	5.7	0.98	4.2	1.7	0.5	1	1.3	<0.1	11	3.08	60	28	12
18	5.9	3.73	20.2	9.3	1.8	3.2	2.3	<0.1	10.8	2.61	57	30	13
19	6.5	1.23	7.1	1.7	0.5	2.6	4.4	<0.1	13	3.64	60	29	11
20	5.9	0.65	4	1.3	0.3	0.7	1	<0.1	11.9	2.43	52	28	20
21	5.9	0.64	4	1.3	0.3	0.7	NES	NES	12.5	2.4	NES	NES	NES
22	5.6	0.57	1.7	0.7	0.5	1.5	0.7	<0.1	9.7	3.64	59	29	12
23	5.8	1.65	8.2	2.5	0.8	1.9	1.9	<0.1	10.8	3.79	56	32	12
24	5.7	0.98	1.7	1.7	0.5	1	1.3	<0.1	11	3.08	60	29	11
25	5.9	1.12	4.3	9.3	1.8	3.2	2.3	<0.1	10.8	2.61	57	30	13
26	6.2	1.22	4.2	1.7	0.5	2.6	4.4	<0.1	13	3.64	58	29	13
27	5.8	0.68	3.8	1.3	0.3	0.7	1	<0.1	11.9	2.43	54	32	14
Average	5.71	1.11	5.62	2.06	0.66	1.96	1.75		11.08	3.00	55.82	30.94	13.24
SD	0.51	0.79	4.20	1.92	0.58	2.21	1.94		3.02	1.06	6.03	3.72	3.47

Notes:
1 = Cation Exchange Capacity
2 = Organic Matter
NES = not enough sample

simulation results could be used to predict larger-scale erosion rates, today such calculations are unreliable beyond the 10-meter scale.

We are currently collecting data from a wide range of land use practices to better refine parameters that may be used for large-scale predictions, such as those from the commonly used universal soil loss equation or Water Erosion Prediction Program models.

Until we are better able to correlate rainfall simulation results with results from large-area annual erosion, rainfall simulation should be used for comparison only. However, rainfall simulation is an effective tool for evaluating and quantifying relative rates of sediment transport resulting from a variety of land use practices.

Rainfall simulation technique

Rainfall simulation attempts to duplicate the physical characteristics of natural rainfall at a scale that is appropriate to the question being studied. Mimicking rainfall characteristics includes attempting to duplicate the range of raindrop size and energy, and to provide a uniform distribution of rainfall over the plot area.

A small (1 m^2) drop-forming rainfall simulator that uses hypodermic needles to produce raindrops is used in this study. The portable 1 m^2 simulator is well-suited to field work and can be used in areas where access is difficult (such as steep vineyard slopes).

The simulator (Figure I) consists of a plexiglass water reservoir fitted with 880 hypodermic needles (23-gauge, 38 mm long) to serve as drop-formers

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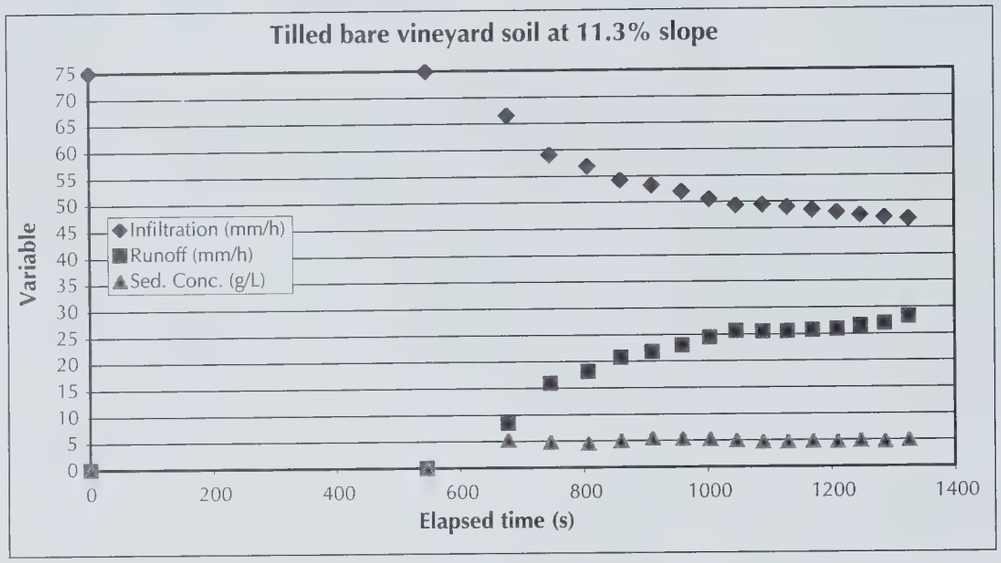

Figure III: Sample data from bare soils showing the infiltration/runoff rate relationship that stabilizes at saturation. Sediment concentration remains constant.

(Figure II). The reservoir is made from two pieces of 15-mm thick plexiglass, 1 meter by 1 meter, with a 5 mm space in between for water. The reservoir is placed about a meter above the soil surface, using an aluminum stand for support.

Water is fed through the meter using a 12-volt pump powered with a car battery or generator. A flow gauge measures the rate of flow into the water reservoir and a valve controls the flow. An aluminum plate (1 meter by 1 meter), fits under the reservoir, just above ground, to protect the soil surface from rainfall generated while the simulator is adjusted.

Purpose and scope of the study

This study was initially pursued in response to the upcoming end of a much-discussed agricultural runoff exemption, with the intent of being proactive by initiating a self-investigation of runoff potential. The study was confined to a small sub-watershed in the Plymouth area that is tributary to the Upper Cosumnes River, and focuses on runoff that contributes to flow in Pigeon Creek and Big Indian Creek in Amador County.

Understanding erosion processes such as infiltration and runoff rates, time to runoff, and sediment yields from different soils, slopes, and land management practices is essential to establishing TMDL (total daily maximum loading) rates and implementing sediment transport control efforts.

Because of the growing wine grape industry in the California foothills, and similarities between Amador County soils and those of other foothill counties, the results are applicable to other grape growing areas. Furthermore, while specific soil types may vary from one region to the next, the general results are likely to hold for grape growing regions beyond the foothills.

Rainfall simulations were performed at several locations in Amador County with the intent of evaluating erosion potential from several cultivation practices on various slopes. To account for differences in antecedent soil moisture, rainfall simulations were conducted at two different times of year. Initial studies were done in the fall, just before harvest, with little antecedent moisture. A second series of rainfall simulations was conducted in the spring, at the same locations.

Nine vineyards

Seven wine grape growers around Plymouth with a total of nine vineyards were included in the study. Site characteristics are summarized in

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Table I. The study area ranged in elevation from 1,051 feet to 1,949 feet.

Because slope is an important aspect in determining erosion potential, efforts were made to include a range of slope in each management practice group. However, because less steep slope areas are, for the most part, under cultivation, measurements from undisturbed soils were possible only at higher slopes.

Bare soil sites included road cuts (non-compacted), dirt roads, bare no-till soils, recently tilled soils, and bare soils under orchards, all without vegetation. Seven bare soil sites were tested.

In spring-till sites, the regular management practice is to till between vine rows in the spring, and allow vegetation to grow. In the fall, such sites contained growth that had occurred after spring till and that had not been retilled. In the spring, the same sites were measured before spring till). Seven spring-till sites were tested.

No-till sites are those in which the vineyard is not tilled at all. Nine no-till sites were tested.

"Undisturbed" sites are not cultivated, but may be pasture land or open hillsides. Four undisturbed sites were tested. In no cases were native grasses or other vegetated sites measured. Also, in no cases were specific cover crops investigated: rather, the vegetative cover included only what the existing seed bank provided.

Methodology / measurements

Portable rainfall simulators were used to measure infiltration/runoff rates, time to runoff, sediment concentrations (SC, g/L), and yields (SY, g/mm runoff). Measurements were conducted at several vineyards with a range of management practices in four treatment groups, including bare soils, tilled with grass cover, no till with grass cover, and undisturbed range soils.

Rainfall simulation plot sizes of 0.64 m^2 were centered below 1 m^2 rainfall at 75 to 120 mm/hr rainfall intensity. (The high rainfall rate was required to generate runoff in some cases and is considerably higher than most natural rainfall in the area. The technique is useful to compare treatments.)

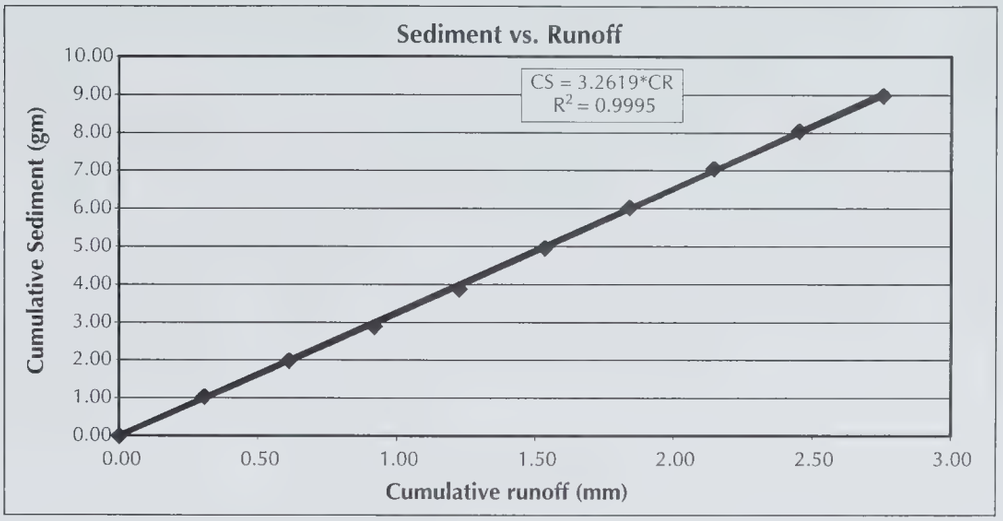

Figure IV: Sample data illustrating the linear relationship between cumulative runoff and cumulative sediment load.

Three to six replications were conducted for each treatment (a treatment is a site with similar slope, soil type, aspect, and cover). Slopes were measured for each site and ranged from 5% to 35% (Table I). Slope aspect measurements were also made.

Soil samples were taken for each plot and analyzed for texture and chemical composition (Table II). After setting up

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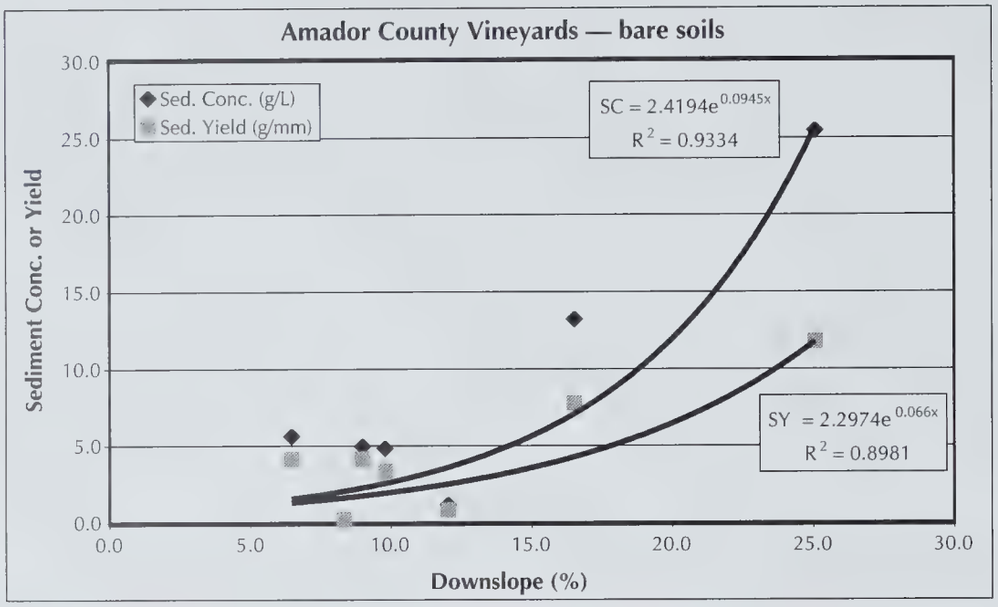
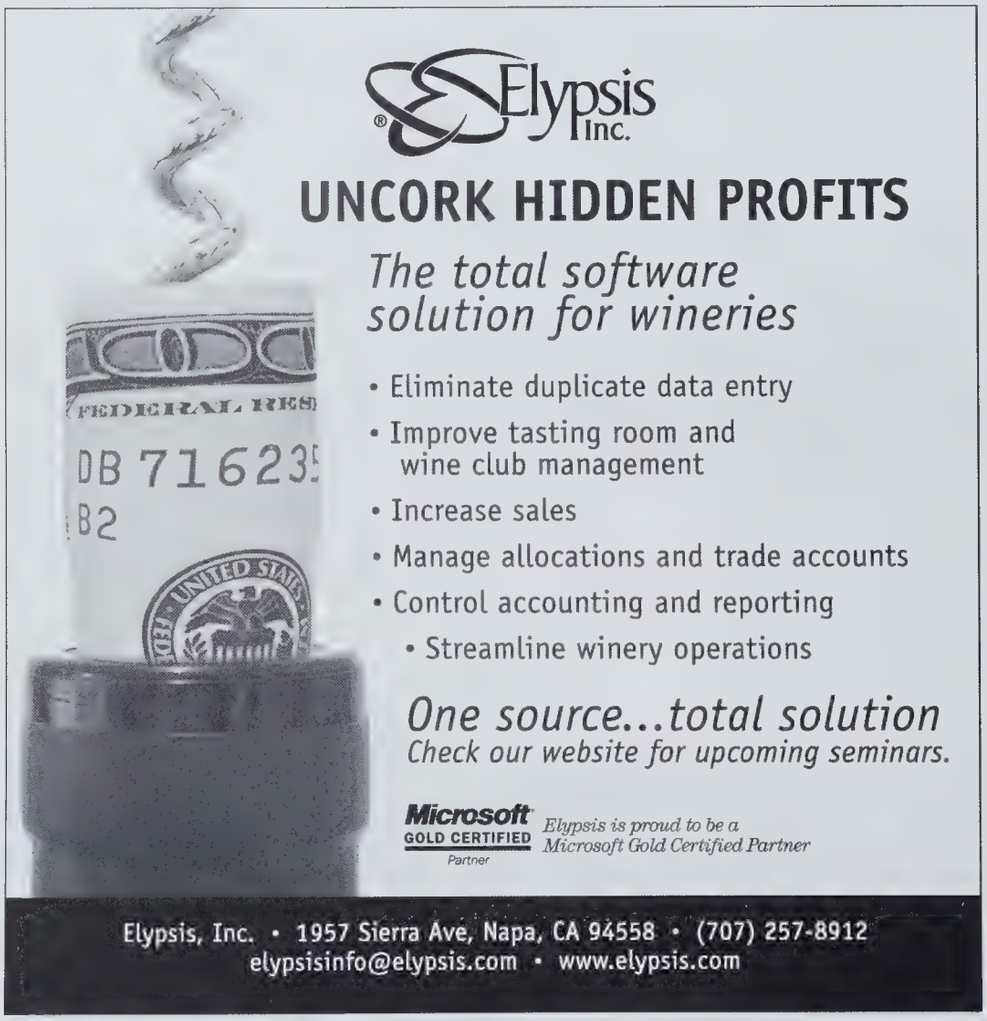


Figure V: Analysis of bare soils, including road cuts, dirt roads, bare no-till soils, and bare soils under orchards. As slope increases, sediment concentration increases. There is a strong correlation between slope and sediment concentration.

the rainfall simulator and obtaining a steady rainfall rate, the soil shield was removed and the time noted. The following procedures were followed: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- Time to runoff was measured from the onset of rain to the first time water ran off the plot. The frame under the simulator was set into the ground such that the top edge of the frame sat at the soil surface. Rainfall accumulated on the soil surface until it overtopped the edge of the frame and ran into the collection trough. The time of observation of the first flow into the collection trough was the time to runoff.
- Runoff rates were measured. 175-milliliter sample bottles were placed under the collection trough. The time it took to fill the bottle was the runoff rate. Runoff rate tends to increase with time to a plateau, at which time, runoff rates stabilize (Figure III).
- Infiltration rates were measured in the field during and after rainfall simulations. Infiltration rate is the difference between the runoff rate and rainfall rate. Infiltration rate tends to decrease with time until stabilization, balancing the runoff rate (Figure III).
- Sediment (TSS) concentration (g/L) was measured in the laboratory from samples taken during rainfall simulation. The contents of each runoff sample bottle were filtered, with the sediment dried and weighed. Sediment concentration is the mass of sediment per liter of collected runoff. In general, sediment concentration tends to be constant throughout the duration of runoff (Figure IV).
- Sediment (erosion) yield (mass/mm runoff) was calculated using all the sediment concentration data and represents an average (linear regression) of this data. The volume of runoff collected is divided by the rainfall simulation plot area to yield a depth of runoff (not rainfall, which would require adding in the infiltration depth) over the plot area. While this number is not completely intuitive, this is the number that will ultimately relate to annual erosion yields.

Results

Soils were relatively similar at all sites: pH average 5.71, EC average of 1.11 dS/m (with two fairly high EC readings of 2.75 and 3.73), organic material percentage average of 3.06% (with an exceptionally high percentage site at 6.08%), and sand-silt-clay ratio

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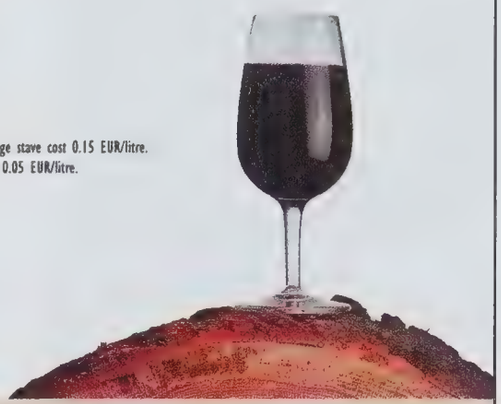

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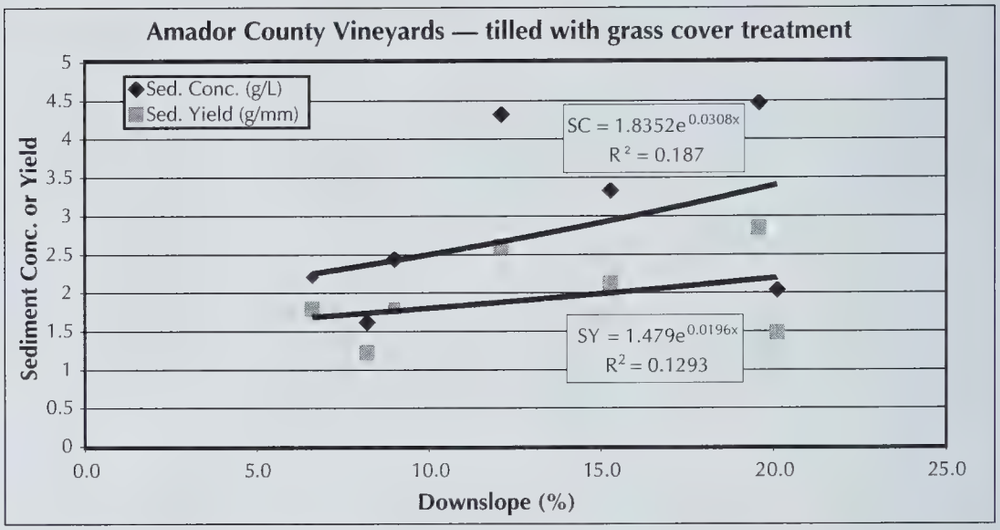

Figure VI: Analysis of tilled soils on which grasses have volunteered. The scale of the y-axis (sediment concentration or yield) is considerably smaller (0 to 5 g/L) than for bare soils (0 to 30 g/L). There is a weak correlation between slope and sediment concentration.

average of about 55%–30%–15% (again with two notable exceptions as shown in Table I).

Results can be evaluated based on vegetative cover and slope. Figures V, VI, and VII summarize the results from bare soils, spring-till sites, and no-till sites respectively.

Sediment concentrations (g/L of runoff) and yields (g/mm of runoff)

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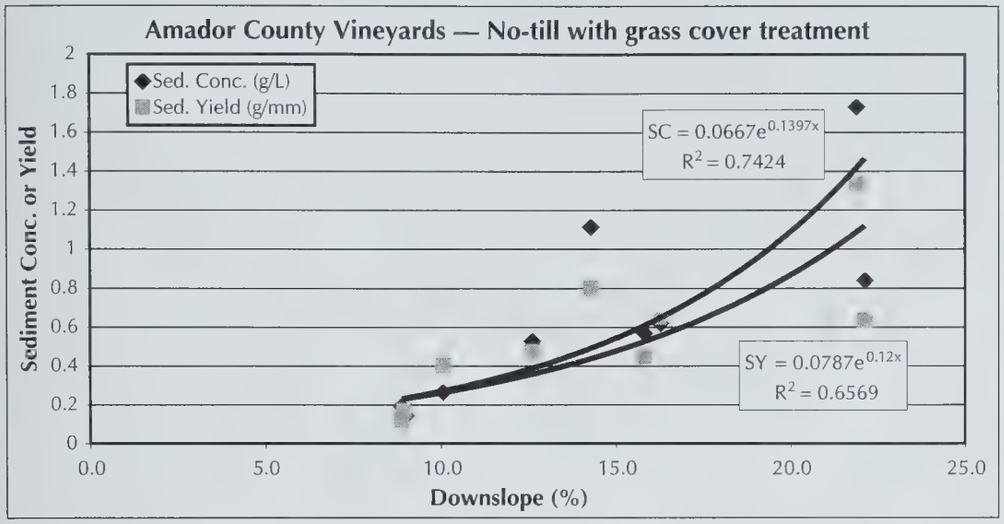

Figure VII: Analysis of no-till vineyards. The y-axis, sediment concentration, is still smaller (0 to 2 g/L) than for tilled (0 to 5 g/L) or bare soils (0 to 30 g/L). There is a stronger correlation between slope and sediment concentration.

from bare-soil sites are summarized in Figure V. Sediment concentration increases as slope increases, with a strong correlation between the two (r^2 = 0.933 for sediment concentration and 0.898 for sediment yield). Sediment concentrations are about 5 g/L runoff at 7% slope and increase to about 26 g/L runoff at 25% slope. Sediment yields range from about

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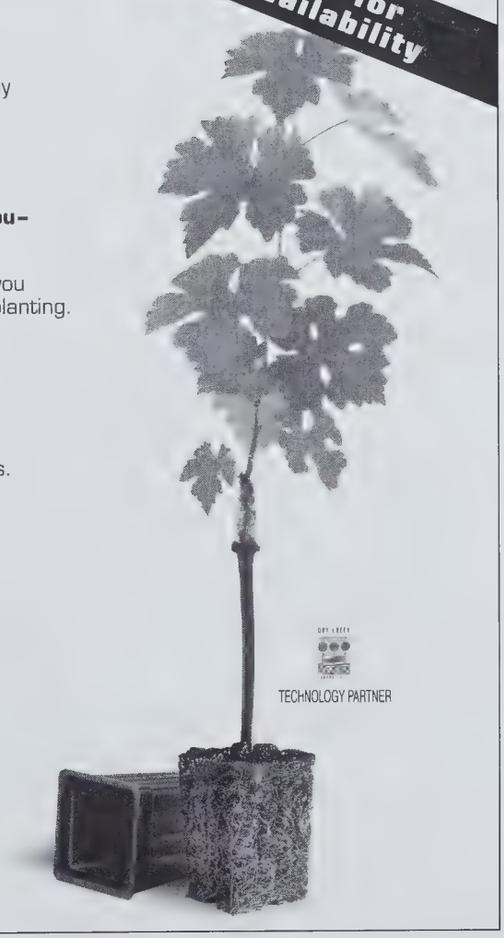

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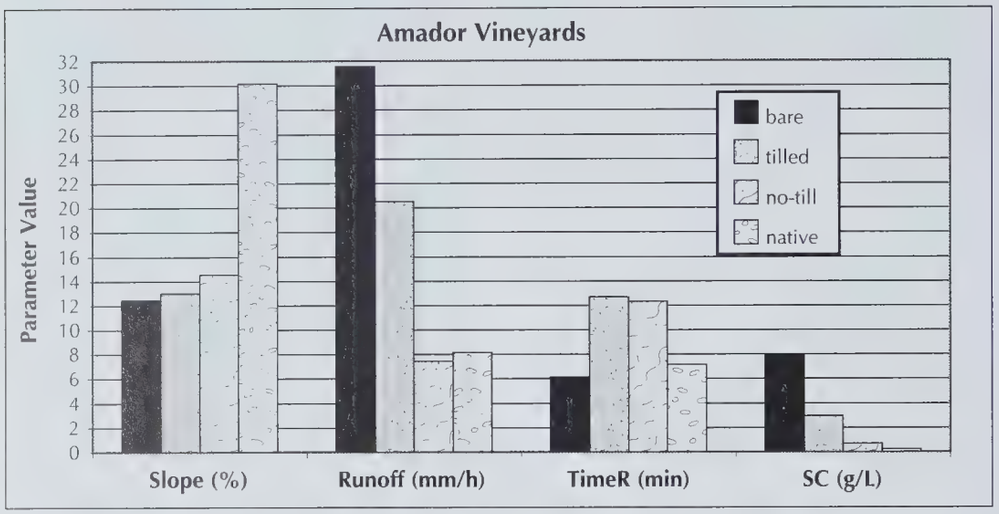

Figure VIII: Summary and plot averages. This graph compares conditions and results from the four plot types measured: bare soils, tilled soils, no-till soils, and undisturbed soils. Undisturbed soils are defined as non-cultivated, but may be range for cattle or sheep. A separate graph for undisturbed soils was not included because of the limited range in slopes (lower sloped soils are, for the most part, under cultivation).

4g/mm runoff to 12 g/mm runoff over the same slope range.

Figure VI shows sediment concentration and yield results from spring-till sites. On these sites, sediment concentration increases as slope increases, but the correlation is weak (r^2 = 0.187 for sediment concentration and 0.129 for sediment yield). Also, resulting sediment yields and concentrations are appreciably lower than those for bare soil, with sediment concentrations of about 2.2 g/L runoff at 7% slope, but up to only about 4.5 g/L runoff at 20% slope. The corresponding sediment yields range from about 1.7 g/mm runoff to about 2 g/mm runoff over the same slope range.

Figure VII shows the sediment concentration and yield results from no-till sites. On these sites, sediment concentration also increases as slope increases, and the correlation is stronger than for spring-till sites (r^2 = 0.742 for sediment concentration and 0.657 for sediment yield).

The resulting sediment yields and concentrations are lower for no-till sites than for spring-till sites, with sediment concentrations of about 0.2 g/L runoff at 8% slope but up to only 41.7 g/L runoff at 20% slope. The corresponding sediment yields range from about 0.2 g/mm runoff to about 1 g/mm runoff over the same slope range.

Unfortunately we are unable to evaluate "undisturbed" sites over the same slope ranges as other treatments. However, comparisons between the three treatments described above and undisturbed soils can be made.

Figure VIII has results of runoff rates (runoff, mm/h), time to runoff (Time R, min), and sediment concentration (SC, g/L) from the four "treatments." The slope illustration is for the average slope measured for that treatment. Thus, while slopes ranged from about 7% to 25% for bare soils, the average for bare soils was 12%. Four undisturbed sites were between 28% and 33% slope (31.5% average).

By depicting results in Figure VIII, we can see the effects of vegetative cover and less soil disturbance. Note that while the average slope for bare soils was lowest (12%), the average runoff rate was highest (33.5 mm/h), although the average time to runoff was faster than in all other treatments (6 minutes). As expected, the average sediment concentration was by far the highest (8 g/L).

The results for spring-till sites indicate that the average runoff rate was fairly high, at about 20 mm/h, yet the average time to runoff was relatively long at 13 minutes. Despite the relatively high runoff rate, the average sediment concentration was just over 2 g/L. While the average slope was steeper for no-till than for either bare-soil or spring-till sites, the average runoff rate was appreciably lower at 6.5 mm/h. The average time to runoff was, however, similar to that for spring-till sites at just over 12 minutes.

At undisturbed sites, despite a noticeable steeper average slope (almost 32 %), the runoff rate was relatively low at just over 8 mm/h. The average time to runoff (7 minutes) was shorter than at spring-till and no-till sites, probably due to the steep slope. However, the average sediment concentration, despite the steep slope, was the lowest at about 0.5g/L. Thus, despite the common wisdom that steeper slopes lead to increased erosion, in undisturbed areas the soil stays in place.

Results of other studies

Extensive work has been done on similar, though perhaps more disturbed volcanic soils in the Tahoe basin on road cuts, ski runs, and restoration sites to evaluate techniques to reduce sediment transport into Lake Tahoe.

Two overriding results emerged from these studies that may be relevant to wine grape growers. The first concerns percentage of vegetative cover. It is common knowledge that more plant coverage translates to less erosion, and that some is better than none. This presumption may be false. Rainfall simulations on sites with up to 40% plant cover show that sediment loads are no less than for bare soils. There appears to be discrete coverage below which vegetative cover is not effective and above which it is, although that point is not yet well defined.

The second vineyard-relevant result indicates that use of well-incorporated compost or woodchips with a mulch cover results in no measurable sediment or water runoff after more than 45 minutes of high intensity rainfall. Mulch trials made use of woodchip mulch evenly incorporated four inches into the soil. The treatment is effective for at least three years, and appears to accelerate soil aggregation, structure, or improved tilth, perhaps due to the

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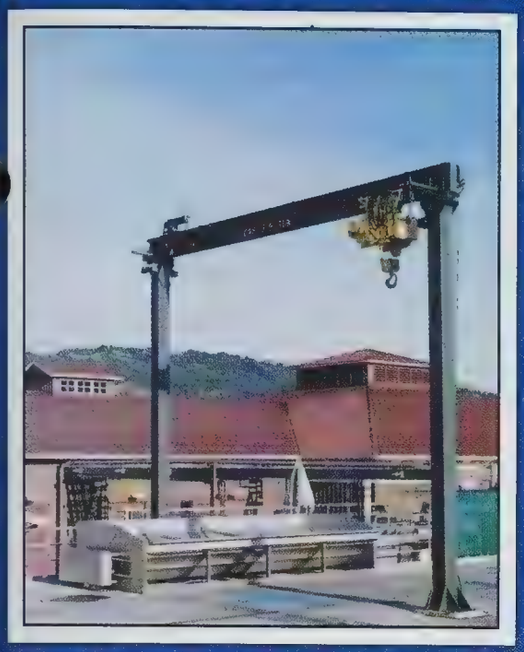

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development of soil micorhizae and fungal elements.

Further investigation into these two results are underway in the Tahoe Basin and other vineyard sites.

Conclusions

Rainfall simulation data coupled with two seasons of rainfall sampling indicates that a no-till strategy results in the least amount of runoff, lowest sediment yields, and longest time before erosion occurs. Bare rows yield the highest sediment concentrations, shortest time to runoff, and correspondingly lowest infiltration rates.

It is generally believed that tillage increases infiltration, thus decreasing runoff (see the runoff/infiltration rate relationship in Figure III). However, in Figure VIII, the runoff rates from both till treatments (bare soils and spring- till) are higher than either non-till treatments (no-till and undisturbed sites).

It does appear that the time to runoff may be improved by some tillage; while no-till sites are not currently tilled annually, they have been in the past, and may have been specifically seeded in the past. However, it is clear that no-till and undisturbed sites result in the lowest sediment concentrations and yields, even on steeper slopes.

Despite the observation that no-till sites yield the lowest sediment concentrations and runoff rates, spring tillage with subsequent vegetation growth reduces sediment transport. If the primary objective is to retain soil on the land, spring till may well achieve that. However, runoff rates from spring-till sites appear to be noticeably higher than from no-till sites. This runoff may be of concern downslope of the vineyard where runoff accumulates along roadsides and ditches.

While the sediment that ends up in the receiving creeks and rivers may not originate from the vineyard, cultivation techniques may contribute to higher runoff rates and accumulation, in turn leading to more scouring of road sides. This effect may be reduced through strategic placement of infiltration ditches, water bars, and/or vegetated swales at row ends, within rows, or at the bottom of vineyards. These techniques serve to slow water transport downslope and dissipate the energy of overland runoff, thus reducing scouring effects and resulting sediment transport.

Summary

- Rainfall simulation yields quantitative data for treatment comparisons;
- Vineyard management practices affect soil runoff and erosion parameters;
- Runoff and erosion rates from no-till sites are lower than with other cultivation practices, and most similar to less disturbed range soils and "undisturbed" soils;
- Vegetation cover is essential in managing erosion. ■

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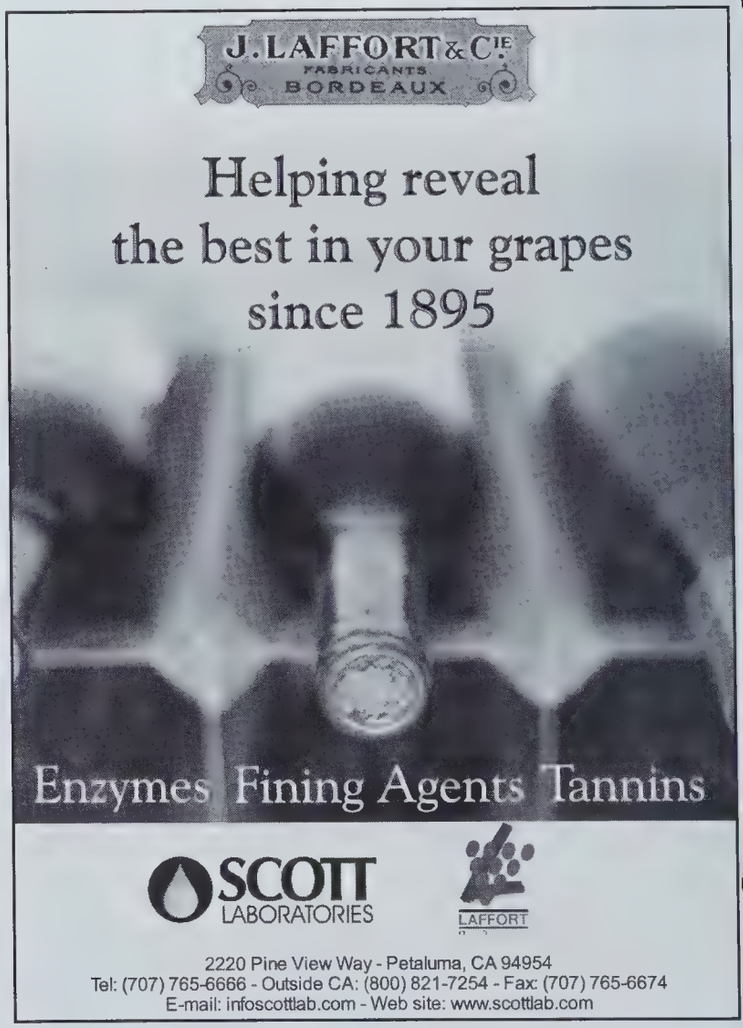
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AVF 2006 SURVEY

Top grape/wine research priorities

Vine mealybug, Pierce's disease, and the impact of viticultural practices on wine composition and flavor rank at the top of the 2006 survey of research priorities among vintners and grape growers, according to the American Vineyard Foundation (AVF).

Every third year since 1997, the AVF has sent surveys to ask for input on critical issues facing the grape and wine industry. The AVF then ranks the responses, and that list becomes a guide as to where limited research funds could best be spent.

In 2006, 3,527 surveys were mailed, and 398 responses received — 282 from viticulture professionals, and 116 from the enology side of the industry. Responses increased from the 2003 survey, when 287 were received (184 viticulture, 103 enology).

"We are very pleased that we received so much input from throughout the industry," says Andy Hoxsey, AVF executive committee member. "While the list contained many old issues that continue to carry over from previous surveys, it underscores the fact that there are many other challenges facing our industry. Identifying them is just the first step. Raising the funds to support research necessary to overcome these challenges is the next step."

"Rootstock improvement and nematodes continue to be near the top of the current list," says Fred Franzia. "The good news for everyone is that AVF co-funded research has made advances in these areas, and that Andy Walker (UC Davis) is releasing new rootstocks in 2007 that display resistance to aggressive nematode species."

"From its inception, we felt that the best people to ask these important questions are those people on the front lines of the industry," says Bob Steinhauer (AVF administrative manager). "This year both the Central Valley Winegrowers Association and Allied Growers aided our survey by sending out questionnaires to all their members, helping to ensure that all aspects of our industry are represented."

Established in 1978 to raise funds for research in viticulture and enology, the AVF is a wine-industry sponsored non-profit organization funded by growers and vintners. Since its founding, AVF has funded over $17 million in wine- and grape-related research. ■

Table I:
Top ten viticulture priorities

1	Vine mealybug
2	Rootstock improvement
3	Pierce's disease
4	Sharpshooters
5	Nematodes
6	Influence of plant/water status on vine performance/fruit composition
7	Impact of viticultural practices on fruit composition/flavor
8	Eutypa and other cankers
9	Rootstock selection and evaluation
10	Nutrient requirements and critical levels

Table II:
Top ten enology priorities

1	Influence of viticultural practices on wine composition/flavor
2	Influence of winemaking practices on wine composition/flavor
3	Control of cork taint
4	Control of microbiological contaminants during aging
5	Color/phenolic constituents
6	Aroma/flavor constituents
7	Factors controlling stuck and sluggish fermentations
8	Brettanomyces
9	Methods to remove "green" or unripe flavors in wine
10	Identification and control of sulfide production

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Is your headspace VACANT?

BY Vincent O'Brien,
Provisor, Australia,
Richard Gibson,
Scorpex Wine Services, Australia

Management of oxygen in the bottle is a critical factor for winemakers, with good reason. Published data shows that contact with oxygen after bottling has a significant effect on wine style and quality.[2,3] Many of the fresh, fruit-driven wine styles now made for the global market do not benefit from oxygen exposure and oxidative change after bottling.

Sources of oxygen exposure that may have an impact on wine quality and style after bottling include:

- Dissolved oxygen in the wine prior to bottling;
- Oxygen taken up by the wine as it is bottled;
- Oxygen remaining in the bottle headspace immediately after the bottle is sealed; and
- Oxygen that enters the bottle through or past the bottle closure after sealing.

The relative quantity of oxygen that enters the wine from each of these sources will determine the extent of the impact that they have on quality and style.

Relative magnitude of oxygen sources

The estimated exposure of bottled wine to oxygen up to one year after bottling is shown in Table I. The total oxygen level in the bottled wine immediately after filling is made up of oxygen present in the wine prior to bottling and oxygen dissolved in the wine during filling.

In normal commercial practice, a well-managed bottling process will give maximum wine oxygen levels after filling of 0.5 mg/L. The oxygen level in wine bottled under poorly-managed conditions can be much higher, up to the point at which wine becomes saturated with oxygen and no further dissolution of oxygen can occur, unless some of the dissolved oxygen reacts with wine components. The saturation concentration in wine is approximately 8 mg/L.

In addition to the wine oxygen content, any residual oxygen in the headspace must be considered, as it will eventually dissolve in the wine and react with wine components after the closure is applied. A 30mm headspace of air contains approximately 2.4 mg of oxygen. A headspace treated to remove air may contain less oxygen.

These data assume that a screwcap closure with an oxygen transfer rate of 0.0005cc per closure per day is used to seal a bottle. This means that the quantity of oxygen entering a bottle each year through the closure will be approximately 0.18cc or 0.25mg (calculated at atmospheric pressure and 15°C using the ideal gas law).

Table I: Selected Sources of Oxygen in Bottle Wine

Wine (mg/L O_2)*	Headspace (mg O_2)*	Closure oxygen ingress (mg O_2/ closure/year)	Shelf life (years)
0	0	0.25	15
0.5	0	0.25	13
0	2.4	0.25	2.2
0.5	2.4	0.25	0.2

* Indicates high potential to vary between minimum and maximum values

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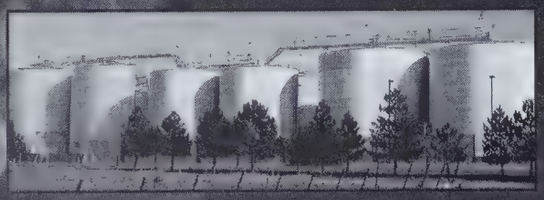

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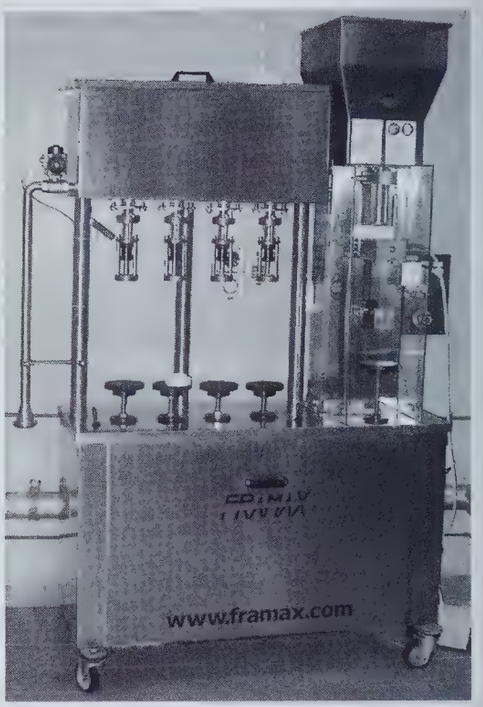

Figure I: Provisor's filling station

The estimated wine shelf-life (for wine in 750 ml bottles) shown in Table I has been calculated assuming that a white wine has been bottled with an initial free SO_2 level of 25mg/L, that the wine becomes unacceptably oxidized when the free SO_2 concentration reaches 10mg/L, and that each milligram of oxygen entering the wine will react with 4 mg of free SO_2.

Results in Table I show that when a wine with a low oxygen concentration is bottled under conditions that minimize oxygen uptake, and bottles are sealed with a closure with low oxygen ingress properties, the headspace oxygen level can make the most significant contribution to the total amount of oxygen to which a bottled wine is exposed. The amount of oxygen that can be entrained in the bottle headspace can have a significant effect on wine shelf-life.

In addition, if the headspace oxygen content varies during a bottling run, there is a significant opportunity for bottle-to-bottle variation in oxygen exposure. This is likely to cause differences in the characteristics of wine in different bottles from the same bottling run. The potential source of variation contributed

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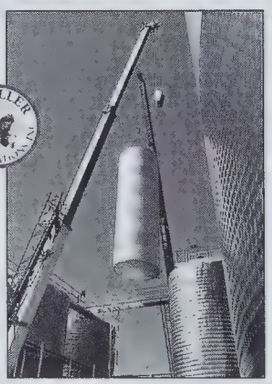

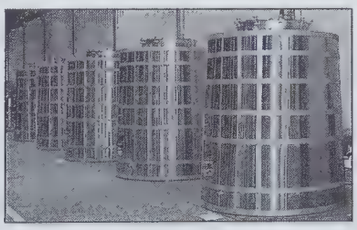

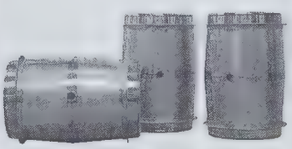

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Figure II: Filling nozzle

by the oxygen content of the bottle headspace must be effectively managed to ensure product consistency.

In summary, the gas in the bottle headspace has the potential to be the dominant source of oxygen exposure for bottled wine. High concentrations of oxygen in the headspace can limit shelf-life, and variation in headspace oxygen content can create product inconsistency.

Measurement of the gas content of the headspace of bottled wine

Published information concerning the oxygen remaining in the headspace of wine bottles after closure application is not readily available. J. Vidal et al (2004) describe methods to measure headspace oxygen in wine bottles, but little information is given concerning actual results.[4]

Many Australian wineries currently estimate the total oxygen content in wine packages by shaking filled and sealed packages and subsequently measuring the dissolved oxygen content of the wine that they contain. This result is compared with the dissolved oxygen content of the wine in unmixed packages. The contribution of the headspace gas to the total oxygen content of the pack can then be estimated.

Table II: Measured Headspace Oxygen Levels After Selected Bottling Operations

	Initial bottle	Bottle degas	Filling	Headspace flush	Headspace and screwcap flush	No treatment
Gas (mL)	750	750	8.5	8.5	8.5	8.5
O_2 % vol	20.7	0.3	13.4	12.2	1.1	20.7
O_2 (mL)	155	2.3	1.1	1.0	0.1	1.8
O_2 (mg/L)*			2.1	1.9	0.2	3.2
SO_2 loss (mg/L)			8.2	7.5	0.7	12.7

* Calculated at atmospheric pressure and 15°C using the ideal gas law

The bottling and sealing techniques currently in use by Australian winemakers seek to achieve minimum headspace oxygen levels by using several techniques, ranging from vacuum evacuation to inert gas blanketing. Given that management of oxygen levels in the bottled product is critical, it would be beneficial for winemakers to have access to tools capable of making direct measurements of the concentrations of the components of headspace gas to validate the effectiveness of headspace management processes.

Recent trial work at Provisor has studied headspace oxygen concentration in wine bottles using a new ana-

lytical technology. The PBI Dansensor Checkmate II EC analyser supplied by Pryde Measurement provides the capability to simultaneously quantify oxygen levels and carbon dioxide levels by sampling gas directly from the bottle headspace.

The studies carried out at Provisor focussed on measuring the oxygen content of the headspace gas in bottles under a range of conditions of empty bottle and headspace treatment. Headspace gas was tested immediately after bottle sealing.

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Headspace treatment studies

Table II shows the oxygen content in the bottle headspace after the bottling operations listed below:

- **Bottle degas**; Empty bottles are subjected to vacuum. The gas content of the bottle is then replaced with gaseous nitrogen. A screwcap is applied to the empty bottle;
- **Filling**; degas bottle as above, remove screw cap and fill the bottle with a range of trial liquids to a height of 30mm from the top of the bottle. Subsequent application of screw cap with no headspace flushing. The filler used is shown in Figures I and II;
- **Headspace flush**; Filling as above, followed by purging of the headspace with nitrogen gas sparging gun and application of a screw cap;
- **Headspace and screwcap flush**; Filling (as above) followed by manual purging of headspace and underside of screw cap with nitrogen gas sparging gun prior to cap application.
- **No treatment**: Filling without bottle purging or headspace treatment.

These treatments were selected to represent a selection of current industry practices. Other practices such as carbon dioxide dosing (solid and gaseous) and liquid nitrogen dosing were not tested.

The following information is for the treatments discussed above:

- Gas (mL) — total volume of gas in the empty bottle or headspace.
- O_2 % vol — percentage of oxygen in the gas in the empty bottle or headspace, as measured by the Checkmate II EC analyser.
- O_2 (mL) — volume of oxygen in the empty bottle or headspace.
- O_2 (mg/L) — concentration of oxygen in a 750 ml bottle of wine that would result from complete dissolution of the oxygen in the headspace.
- SO_2 loss (mg/L) — loss of SO_2 that would result from dissolution of the headspace oxygen in 750 ml of wine.

The results in Table II highlight the importance of reliable and effective headspace flushing operations after

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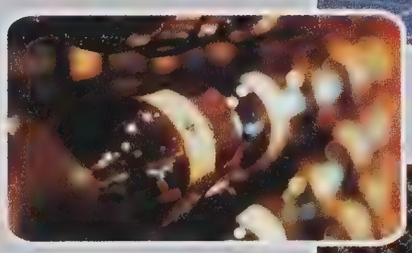
Terre Rouge - 14.45 kW Solar System



Premier Power installed a 35kW solar system at L'Aventure Winery in Paso Robles, CA. **"My favorite thing about the solar panels is that we are decreasing our impact on the environment, and this is a big part of sustainable agriculture,"** says Dave DeBusk, vineyard manager.

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bottle filling. After removal of oxygen from the bottle prior to filling, the headspace oxygen content ranged from almost zero to 1ml, depending on the effectiveness of the headspace flush. Gaseous nitrogen flush of the headspace alone left a much higher content of oxygen in the headspace than a combined gaseous nitrogen flush of the headspace and underside of the screwcap.

When no headspace treatment was carried out after filling, oxygen levels in the headspace were very high, even though the bottles had been degassed prior to filling. This demonstrates that removal of oxygen from the bottle prior to filling, while a good practice to reduce oxygen uptake during filling, cannot guarantee an oxygen-free headspace. The reasons for this are clearer when the mechanics of the filling process are observed.

The filler head places wine in the bottle through a tube that is inserted into the bottle neck. When the tube is removed from the bottle, air replaces the volume occupied by the tube. Consequently, effective headspace flushing with inert gas to remove this air after filling is required to minimize headspace oxygen levels.

Conclusions

This brief investigation of oxygen in the headspace of bottles after filling shows that current industry bottling practices may not prevent the exposure of bottled wine to oxygen. The extent of the variation that is possible in headspace oxygen content could cause significant bottle-to-bottle variation.

The study shows that both the bottle headspace and the underside of the screwcap must be managed after filling when gaseous nitrogen is used. The effectiveness of this technique is likely to be strongly influenced by the gas flow rates, duration of gas entry and dispersal patterns of the gas.

Winemakers who seek optimum oxygen management in bottled wine must give close attention to the management of headspace oxygen during bottling. Provisor can assist winemakers to audit bottling practices to minimize oxygen uptake and optimize processes to minimize bottle-to-bottle variation. ■

Dr. O'Brien is a process engineer leading the Innovation and Development Group at Provisor. Provisor is currently involved in the independent performance benchmarking of a range of products and processing including closure and bottling operations. Provisor has significant experience in process development programs tai-

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Richard Gibson is the principal of Scorpex Wine Services, a company that provides technical and strategic consulting services to the suppliers, members, and customers of the global wine industry. Gibson has considerable experience in the technical management of bottling and sealing processes to maximize product quality.

The authors would like to thank Pryde Measurement for making the PBI Dansensor Checkmate II EC analyser available for this study.

This text was edited from original publication in the October 2006 Australian & New Zealand Grapegrower & Winemaker.

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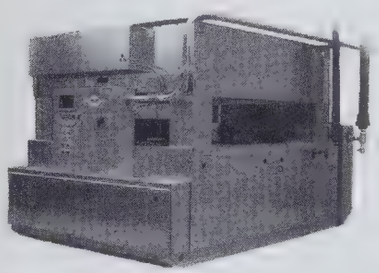

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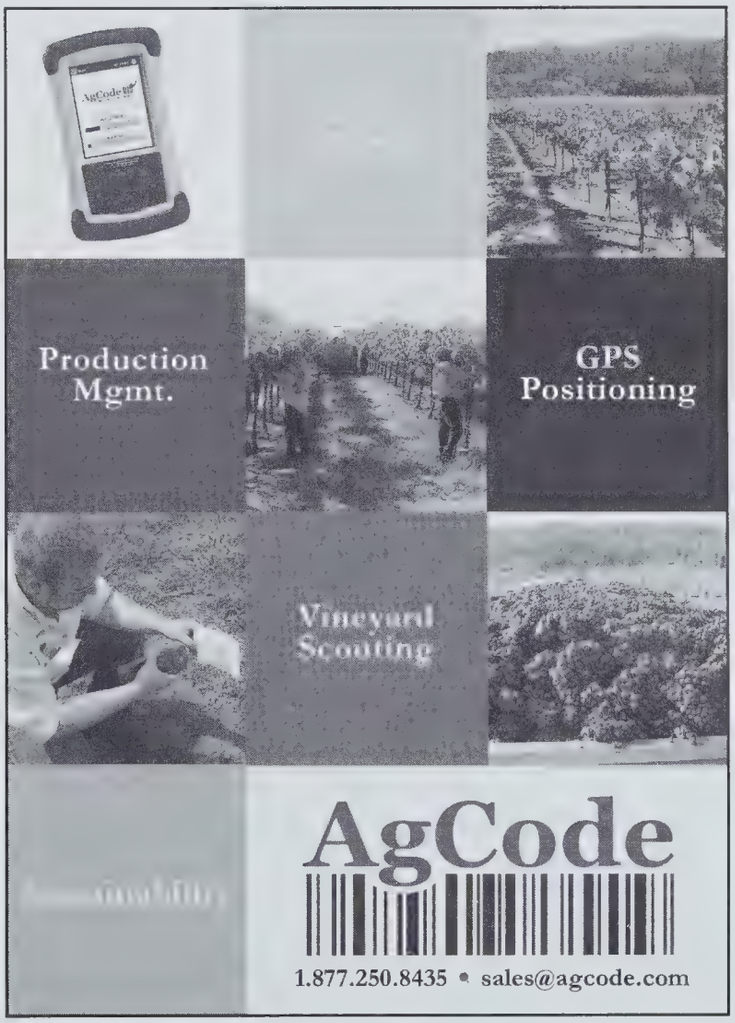

Measuring oxygen ingress during bottling/storage

BY George K. Crochiere,
Crochiere & Associates

Oxygen is a key reactant that causes a sensory change in wine in its package. The amount of oxygen and the rate at which it is incorporated into a package affects the rate and sequence in which the oxidizable chemical compounds in the wine are consumed — or oxidized — thus changing the sensory properties. Oxygen is introduced into a wine during filling, from sources such as the headspace, during closure application, and during storage via ingress through the closures for glass bottles or other plastic package components.

This study, will show how much oxygen can be added at each stage, the benefits of some corrective measures, and how specific closure and packaging tests can be used to select the specific package (closure, liner, bag, or plastic bottle) needed in order to achieve the long-term wine development or preservation desired. Actual data collected from bottling lines and package testing will be presented and will show that all similar corks, closures, (screwcaps, prethreaded plastic, and metal caps), liners (tin or Saranex gaskets in closures), and plastic bottles do not always perform in a similar way.

The methods when used by wineries have two main purposes: 1) to achieve consistent package-to-package oxygen exposure through improved bottling line procedures and reliable packaging, and 2) to allow for the specific amount of oxygen desirable for your product; this usually implies minimizing the oxygen, but this may not be so for the wine industry.

Special note: In doing the work that led to this report, it was discovered that the most common wine bottle closures all have sealing and barrier problems that would not be acceptable in any other beverage industry:

1) The sealing and barrier properties of most screw-cap closures using liners such as Saranex, tin, or other barriers over expanded polyethylene are extremely inconsistent. Figures I and II

Hogue Cellars (Prosser, WA) has bottled more than 75% of Hogue wines under screwcap since 2005, including Hogue red and white wines (SRP under $10), Genesis Riesling, and Hogue Terroir wines (sold almost exclusively through the tasting room and wine club). In-line sparging of white wine with liquid nitrogen, just after filling, is done with an Easy Doser VS (Vacuum Barrier Corporation, Woburn, MA). Hogue applies 30x60 screwcaps (with Saranex liner [no tin layer]), with a five-head MBF Capamatic 360-5V capper.

[George Crochiere is a polymer packaging scientist with more than 25 years experience developing, testing, and problem-solving packages for many food and beverage industries.]

illustrate the differences between good, acceptable, and poor performance. Analysis of the bottles and closures indicates that the failure is with the liner materials, as evidenced by many microscopic creases in the liners where they seal the bottles.

2) The recovery or expansion of many natural and synthetic corks after insertion is quite variable. The negative headspace pressure created by a vacuum corker that is not optimized for zero residual vacuum allows different amounts of air to be pulled into the bottle soon after closure insertion, which could counteract any special closure barrier properties. Special test methods have been developed to separate the impacts of oxygen ingress soon after closure insertion from long-term oxygen ingress due to other causes.

Total Oxygen Pickup

Total Oxygen Pickup (TOP) is a term used in several food and beverage industries to quantify the amount of oxygen added to a beverage during the filling process and subsequent storage of the packaged product. It is used in the beer industry to optimize and monitor filling lines in the ongoing quest for "zero defect" production, and to ensure consistent beverage quality from filling to consumption.

In bottling, total oxygen pickup includes oxygen uptake from absorption in the tank, pickup from hoses, turbulence in the filler bowl, the mixing of wine with air during filling, air in the headspace, and ingress through the package. The units typically used are either ppm or ppb for all components and are easily added together. By using a single concentration unit, different package types and sizes can be evaluated and compared to one another.

To determine the oxygen ingress into a package, measurements of the oxygen accumulated in packages filled with deoxygenated alcohol solutions are performed. While this test is intended to determine the oxygen ingress, it has also proved to be effective in determining closure sealing performance and package integrity. This is useful for evaluating the performance of similar products from different suppliers.

When total oxygen pickup is plotted against time, we can see conditions where a wine can receive a large dose of oxygen during filling, followed by very little ingress through the package, compared to a process that adds very little oxygen during filling, followed by high oxygen ingress. At some point in time, wines in both packages will be exposed to the same amount of oxygen, but at different rates of ingress. This is likely to produce wines with different sensory properties over time. This is an area of future research that may help winemakers better understand the stability, development, and degradation of wines.

Process measurements

Dissolved oxygen measurements are made at several key points in the filling

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process. An oxygen meter with a flow cell and a quick connection, such as the Orbisphere Micrologger or a similar instrument, can be used to check the dissolved oxygen at numerous points in the process, especially if quick connection fittings are installed. Basic testing locations include the tank outlet, freshly filled bottles, and freshly closed bottles.

Additional sampling can be performed at locations such as the top of the tank, filter, and filler as a means of optimizing and controlling the process. Table I lists sampling locations, measurements to be made, and some corrective actions that can be performed to minimize oxygen pickup.

Total Package Oxygen

Total package oxygen (TPO) is a calculated value that combines the dissolved and headspace oxygen — the mass of the oxygen in the liquid plus the oxygen in the headspace divided by the volume of liquid in the package. It is the amount of oxygen in a package that is available to react with the beverage in that package.

Before the TPO can be determined, the freshly filled and closed bottle must be shaken to establish equilibrium between the dissolved oxygen and headspace oxygen. TPO can then be determined in two ways. Dissolved oxygen and headspace oxygen concentrations can be measured separately along with their volumes, and the TPO calculated. Alternatively, by using the measured dissolved oxygen, temperature, and liquid and headspace volumes, the TPO is calculated using equations provided by the oxygen meter supplier. The Orbisphere Package Analyzer does this automatically.

Bottling line examples and results

Table II shows the measurements made on a number of bottling line configurations, ranging from hand filling to a line with pre-evacuation, vacuum filling, and liquid nitrogen (LN_2)-dosing or vacuum-corking. The oxygen pickup for the bottling processes measured shows that the most significant reductions in oxygen levels can be made by using liquid nitrogen injection, vacuum filling, and vacuum corking. Bottle pre-evacuation prior to going into a vacuum filler does not greatly reduce the oxygen levels.

Table I. Total Oxygen Pickup monitoring locations, corrective actions

Location	Measurement	Corrective actions
Tank	Dissolved oxygen	• Bubble/blanket with inert gas (argon or nitrogen; carbon dioxide can also be used but can carbonate the wine)
Hoses	Dissolved oxygen	• Minimize use and length of hoses • Purge hoses with inert gas • Use oxygen-barrier hoses • Minimize couplers, keep in good repair
Filter	Dissolved oxygen	• Set up filter to minimize added and trapped air
Filler	Dissolved oxygen	• Bubble/blanket with inert gas • Vacuum fill • Optimize and maintain filling heads
Bottle pre-evacuation		• Vacuum and inert gas bottle flush helps • Liquid nitrogen injection • Double evacuation and inert gas flush on filling head is best
Freshly-filled bottle	Dissolved oxygen	• Determines level of oxygen in wine as a result of all prior additions
Headspace evacuation or flush		• Vacuum corking helps if set up correctly • Minimize headspace volume • Inert gas flush has minimal benefit • Liquid nitrogen (LN_2) or dry ice snow injection is most effective if set up correctly
Closure-flush		• Flushing inside of closure with inert gas just prior to application can help
Freshly-closed bottle	Total Package Oxygen	• Determines oxygen added to bottle from headspace

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Table II. Examples of Oxygen Pickup during filling / closing process for 750 ml bottles

Process	Tank bottom (ppm)	Filler and pre-evacuation	Filled bottle dissolved oxygen (ppm)	Oxygen Pickup from tank to filled bottle (ppm)	Closure and headspace treatment	Initial Total Package Oxygen (ppm)	Oxygen Pickup due to headspace (ppm)	Oxygen Pickup due to filling/ closing process (ppm)
A	0.01	Gravity hand filler	2.65	2.64	Cork without vacuum	4.47	1.82	4.46
B	0.01	Rotary vacuum filler without pre-evacuation	0.80	0.78				
C	0.01	Rotary vacuum filler with separate pre-evacuation	0.56	0.55	Cork with vacuum	0.99	0.43	0.98
D	0.01	Rotary vacuum filler with separate pre-evacuation	0.61	0.60	30x60 without LN_2	5.37	4.75	5.36
E	0.01	Rotary vacuum filler with separate pre-evacuation	0.61	0.60	30x60 with LN_2	1.30	0.69	1.29
F	0.01	Rotary vacuum filler with separate pre-evacuation	0.57	0.56	30x60 with LN_2	1.25	0.68	1.24

A source of bottling line inconsistency is that, during line stoppages and interruptions, bottles already purged or dosed with LN_2 are left on the conveyor, allowing the inert gas to escape and oxygen to enter the bottle. These bottles are then sealed with additional oxygen. Procedures to remove and either re-evacuate them or discard them would minimize product variability.

As a comparison of what is technically and commercially possible, the best-run beer bottling lines are operating with oxygen pickups in the 0.05 to 0.15 ppm range; average lines operate with 0.20 to 0.40 ppm oxygen pickup. This is not implied as a target for the wine industry, but a reference of what is possible. Beer is much more vulnerable to oxygen than wine; 1 ppm of total oxygen pickup is enough to destroy most beer.

Closure Oxygen Ingress determination

Plastics and polymers (including natural polymers such as cellulose in cork and wood) used as gaskets, liners, closures, stoppers, corks, bags, bottles, and hoses all absorb water, alcohol, flavors, and odors. Although each polymer absorbs these materials at different rates and with varying degrees of effects, the barrier properties almost always deteriorate as more materials are absorbed.

In addition, many oxygen scavengers used in plastic bottles and liner materials are activated or accelerated by the absorption of moisture. The net result is that, in order to evaluate the barrier properties of a package for use with a beverage, evaluation must be done on filled packages, creating similar conditions to the commercial environment.

Table III. Optimum Oxygen Ingress values for 30 mm metal wine closure liner materials on 750 ml bottles

Liner Barrier Material	Oxygen Ingress per day (ppm TPO/day)	Oxygen Ingress per year (ppm TPO/year)
Tin	0.000005	0.002
Saranex	0.00002	0.006
Polyester	0.004	1.5
Polyethylene	0.016	6

It is impossible to measure the oxygen ingress on wine-filled packages. The concentration will always approach zero (5 to 10 ppb) as the oxygen incor-

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porated in and entering the package reacts with wine components.

The method employed in this study is used in the beer and juice industries for evaluating crown liners, plastic bottles, and plastic caps as it has provided the best information for predicting shelf life.

Filled Package Oxygen Ingress test method

Bottles, bags, or pouches are filled with a stabilized deoxygenated alcohol solution or water. Since the wine in a package has an oxygen concentration of approximately 0.01 ppm TPO for most of its life, we try to duplicate this in the test filling process. For reliable results, initial oxygen levels below 0.05 ppm TPO are the goal. Higher initial oxygen levels result in lower oxygen ingress rates, as the concentration differential between inside and outside the package and thus the ingress driving force is reduced.

The oxygen content of the liquid in packages is measured periodically and the results plotted against time. The resulting plot shows the consistency of the closure performance, the oxygen ingress rate, and the activity of oxygen scavengers. Figures I, II, and III illustrate typical plots obtained for various roll-on pilfer proof, twist-on pilfer proof, and cork closures. The method is commonly used for all types of closures, bottles, bags, and pouches.

Since a wine consumes oxygen in a commercially filled bottle, and the oxygen levels quickly stabilize around 0.005 to 0.010 ppm TPO, it is best to use the slope of the TPO versus time curve near that TPO level to estimate long-term ingress rates and shelf life. If barrier materials like tin or Saranex are performing to their potential, this would be a non-issue as it would take more than 150 years to increase the TPO level by 1 ppm where the saturation level is approximately 10 to 12 ppm (depending on headspace volume).

These tests are often performed for extended times to evaluate long-term reliability or oxygen scavenger capacity. It should also be noted that until a package is performing reliably and consistently over the short- term, there is little value in evaluating long-term reliability or resistance to warehousing, transportation, etc.

While testing for only one to six months may appear to be insufficient to evaluate the long-term reliability of a closure or package, it has been a reliable tool, to date. Alternative test methods are available that maintain the low concentration of oxygen and determine ingress, but these methods are more costly and less accurate.

Lined closure test results

Over the last three years, we have tested many closures for oxygen ingress. Figure I (0 to 7 ppm range) and Figure II (0 to 0.2 ppm range) show some examples of the data generated for four different Saranex-lined closures. The data with the blue dia-

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monds was the only closure that performed to expectation. This is the level of consistency expected of any commercial liner, closure, or plastic bottle by other industries.

Other Saranex liners exhibited varying degrees of inconsistent barrier properties and higher oxygen ingress. The examination and analysis of the application conditions, (top load force, side roller force, reform dimensions, alignment, thread formation), closures, bottles, and liners revealed microscopic creases in the liner material where it seals against the glass. This is where the oxygen is entering the bottle, as the application conditions were set to manufacturer's recommendations, and the bottles and closures were in very good condition.

Based on the closures tested to date, the optimum barrier properties for some common liner materials are in Table III. This is the level of oxygen ingress that should be expected if the closures, liners, bottles, and application equipment are all performing at their best. Based on these results, if the tin and Saranex liners are both functioning properly, there would be no significant difference in the barrier properties and performance on wine. If higher ingress rates are desired, other barrier materials such as polyester and polyethylene will provide higher oxygen ingress rates in a controlled manner.

Table IV lists results from eight closures tested with tin liners and 16 closures with Saranex liners (all closures are commercially available). Tin liners performed quite reliably — seven were acceptable, while one showed higher levels of oxygen ingress and variability.

Most of the Saranex liner closures exhibited extremely high oxygen ingress rates and inconsistency. Only one Saranex liner performed to expectation, and only four more were acceptable if we allow the average oxygen ingress to be ten times that of the best. As noted above, this was due to the presence of microscopic creases in the liner material. Additional evidence, causes, and corrective actions were discovered, but these details are proprietary.

This level of inconsistency within a source or between sources is unacceptable in any other industry where barrier properties are a concern. It should be a priority of every producer of closures and liners to correct this as soon as possible. In addition, any winery using or considering screw-caps should carefully evaluate each source.

Cork test method and results

Figure III shows examples of results from testing wine bottles sealed with three cork-type closures inserted after vacuum evacuation of the bottle headspace and measured over time as described for aluminum, plastic, and steel caps. There are many problems with the technique used for evaluating corks.

Initial oxygen levels and values are very high and inconsistent compared

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Table IV. Comparison of Oxygen Ingress measured for commercial closures on 750 ml bottles

Liner Material Type	Closure Type	Oxygen Ingress per day (ppm TPO)		Oxygen Ingress per year (ppm TPO)	Years to 5 ppm TPO Oxygen Ingress
		Average	Standard Deviation	Average	Average
Tin 1	**Roll-on**	**0.00005**	**0.00010**	**0.017**	**294**
Tin 2	**Twist-on**	**0.00007**	**0.00004**	**0.024**	**204**
Tin 3	**Roll-on**	**0.00007**	**0.00013**	**0.025**	**199**
Tin 4	**Twist-on**	**0.00007**	**0.00005**	**0.027**	**185**
Tin 5	**Twist-on**	**0.00008**	**0.00007**	**0.029**	**174**
Tin 6	**Roll-on**	**0.00010**	**0.00018**	**0.035**	**142**
Tin 7	**Roll-on**	**0.00013**	**0.00024**	**0.046**	**109**
Tin 8	Roll-on	0.00043	0.00055	0.158	32
Saranex 1	**Twist-on**	**0.00008**	**0.00009**	**0.029**	**171**
Saranex 2	**Twist-on**	**0.00021**	**0.00028**	**0.078**	**64**
Saranex 3	**Twist-on**	**0.00029**	**0.00019**	**0.104**	**48**
Saranex 4	**Twist-on**	**0.00030**	**0.00037**	**0.109**	**46**
Saranex 5	**Roll-on**	**0.00069**	**0.00037**	**0.253**	**20**
Saranex 6	Twist-on	0.00081	0.00055	0.295	17
Saranex 7	Roll-on	0.00108	0.00072	0.395	13
Saranex 8	Roll-on	0.00161	0.00153	0.588	8.5
Saranex 9	Twist-on	0.00238	0.00271	0.868	5.8
Saranex 10	Roll-on	0.00466	0.00403	1.702	2.9
Saranex 11	Roll-on	0.00486	0.00560	1.772	2.8
Saranex 12	Roll-on	0.00502	0.00734	1.831	2.7
Saranex 13	Roll-on	0.00593	0.00770	2.165	2.3
Saranex 14	Roll-on	0.00820	0.00801	2.993	1.7
Saranex 15	Roll-on	0.01816	0.01452	6.629	0.8
Saranex 16	Twist-on	0.02730	0.02837	9.966	0.5
Polyester	Roll-on	0.01330	0.01006	4.856	1.0
Polyethylene	Roll-on	0.02980	0.01008	10.876	0.5

Bold = acceptable sealing and barrier performance

to what is achieved with most other types of packages. High initial oxygen levels are due to the air rushing into the bottle as the cork recovers after compression and insertion.

High oxygen levels prevent attainment of the oxygen concentration differential that will be present when the package contains wine, as oxygen in the test bottle is not removed by the inert test solution. Therefore, the data is too inconsistent and the ingress rates too low to reliably determine the rate of oxygen ingress through the closure.

In order to isolate the long-term oxygen ingress and the initial rush of air into the bottle, the evaluation of cork-type closures is divided into two components.

The long-term oxygen ingress through cork closures is determined by using a proprietary method of filling and corking the bottle that allows us to achieve initial oxygen levels of 0.010 to 0.020 ppm TPO. Bottles are stored and measured over time, using the same method used for other closure types.

Table V lists the results for a number of cork-type closures, including two of the new "alternative" closures. Several of the corks listed have been tested by other methods and the trends in consistency and relative ingress rates are similar to results from these tests.

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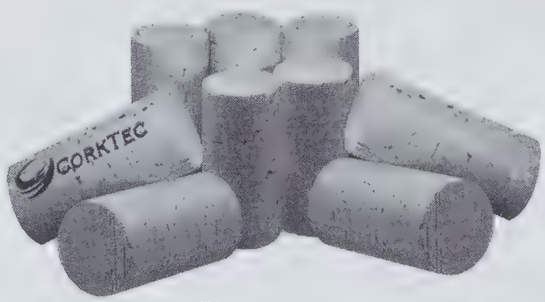

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To study the initial ingress of air during cork recovery, corks were vacuum-inserted into low oxygen bottles with high and consistent headspace volume and vacuum in order to allow air into the bottle. The amount of air that gets into a bottle is then dependent on the recovery rate of the cork and is measured by the TPO shortly after corking. Slower recovery allows more air to rush in and gives higher oxygen levels.

This parameter may not be critical to all wineries, especially if their production lines are adjusted to have no net headspace vacuum or pressure, but it is a parameter that may be important to some and is an indication of the consistency of the cork.

Table V. Comparison of Oxygen Ingress data for cork closures on 750 ml bottles

	Data obtained from bottles corked at 0.02 ppm Initial TPO			Data obtained by corking bottles at 18 inches of vacuum	
	Oxygen Ingress rate (ppm TPO)			Ingress of Oxygen immediately after vacuum corking (ppm TPO)	
	per Day	Per Year	Years to 5 ppm	Average	Standard Deviation
Natural cork	0.027	9.9	0.5	5.1	2.0
Technical cork	0.018	6.4	0.8	8.8	5.0
Synthetic cork A	0.038	13.7	0.4	7.8	3.0
Synthetic cork B	0.016	5.9	0.9	11.0	7.5
Synthetic cork C	0.065	23.6	0.2	3.6	2.0
Synthetic cork D	0.058	21.0	0.2	10.3	0.7
Synthetic cork E	0.014	5.0	1.0	6.4	3.0
Alternative Closure X	0.002	0.8	6.0	0.0	
Alternative Closure Y	0.021	7.8	0.6	0.0	

Total oxygen pickup

Combining oxygen pickup data from the filling process with the oxygen ingress data on the various closures gives the total oxygen pickup over time. Figure IV shows several examples plotted on a time scale extrapolated out to two years. It shows that all the oxygen added during transfers, filling, and headspace appear as a single large dose, potentially reacting with all oxidizable compounds in the wine.

By contrast, the oxygen ingress, especially for the better barrier closures, will likely only react with the most reactive compounds in the wine. There are several cases where lines intersect, providing a situation where the wine could be exposed to the same amount of oxygen but with different rates of exposure.

Figure V shows the same data plotted against each process; this allows us to better examine the oxygen contributed from each measured stage of the filling process relative to the ingress of oxygen through the closure.

Conclusions

The use of measurements of oxygen pickup and package oxygen ingress provides the winemaker and scientist with information about the actual amounts of oxygen to which wine is exposed over time. This is a critical factor any time oxidation research is being conducted.

From a process and production viewpoint, this information has proven indispensable in the beer industry as companies strive to reduce defects, improve product consistency for consumers, and extend shelf life. The same may be true for the wine industry.

Because wine is relatively resilient to oxygen, it is likely more valuable for wineries to focus initially on striving for consistent total oxygen pickup rather than for the absolute lowest possible TOP. Situations like bottling line stoppages when using bottle pre-evacuation or liquid nitrogen injection can cause extreme inconsistency if dosed bottles are not removed before restarting the line.

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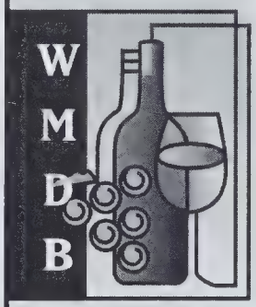

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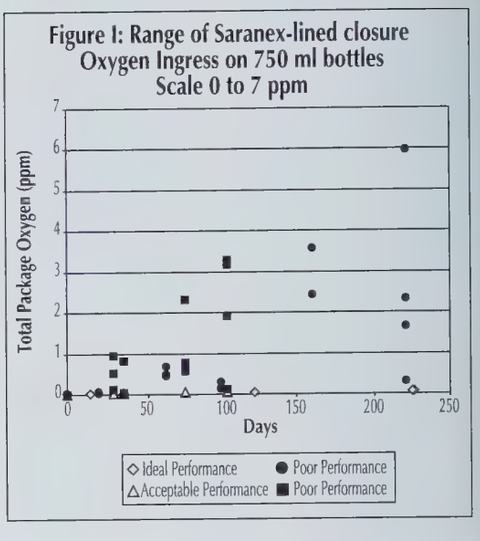
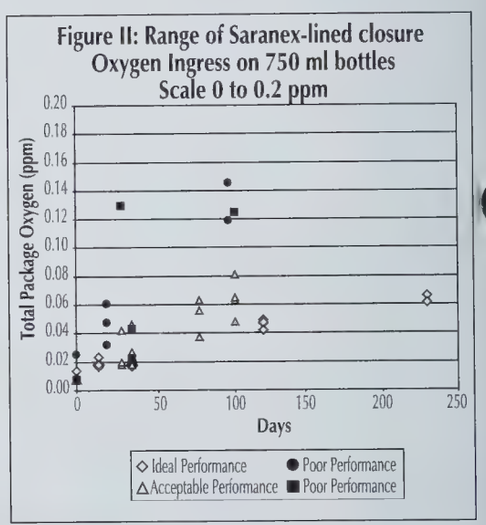
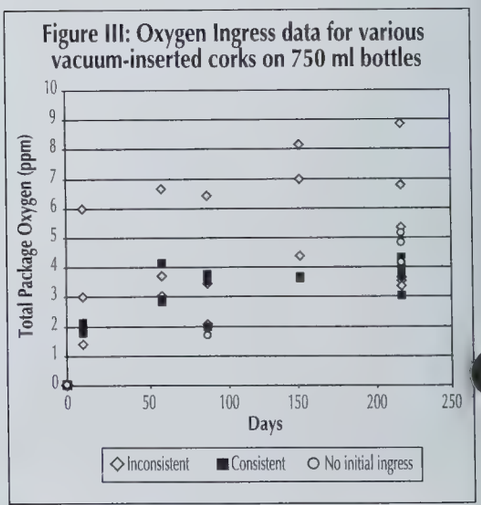
When using a vacuum corker in production, it is extremely critical to optimize the vacuum level and headspace volume in order to minimize oxygen ingress during cork recovery, as recovery times of natural, technical, and synthetic corks can be extremely inconsistent.

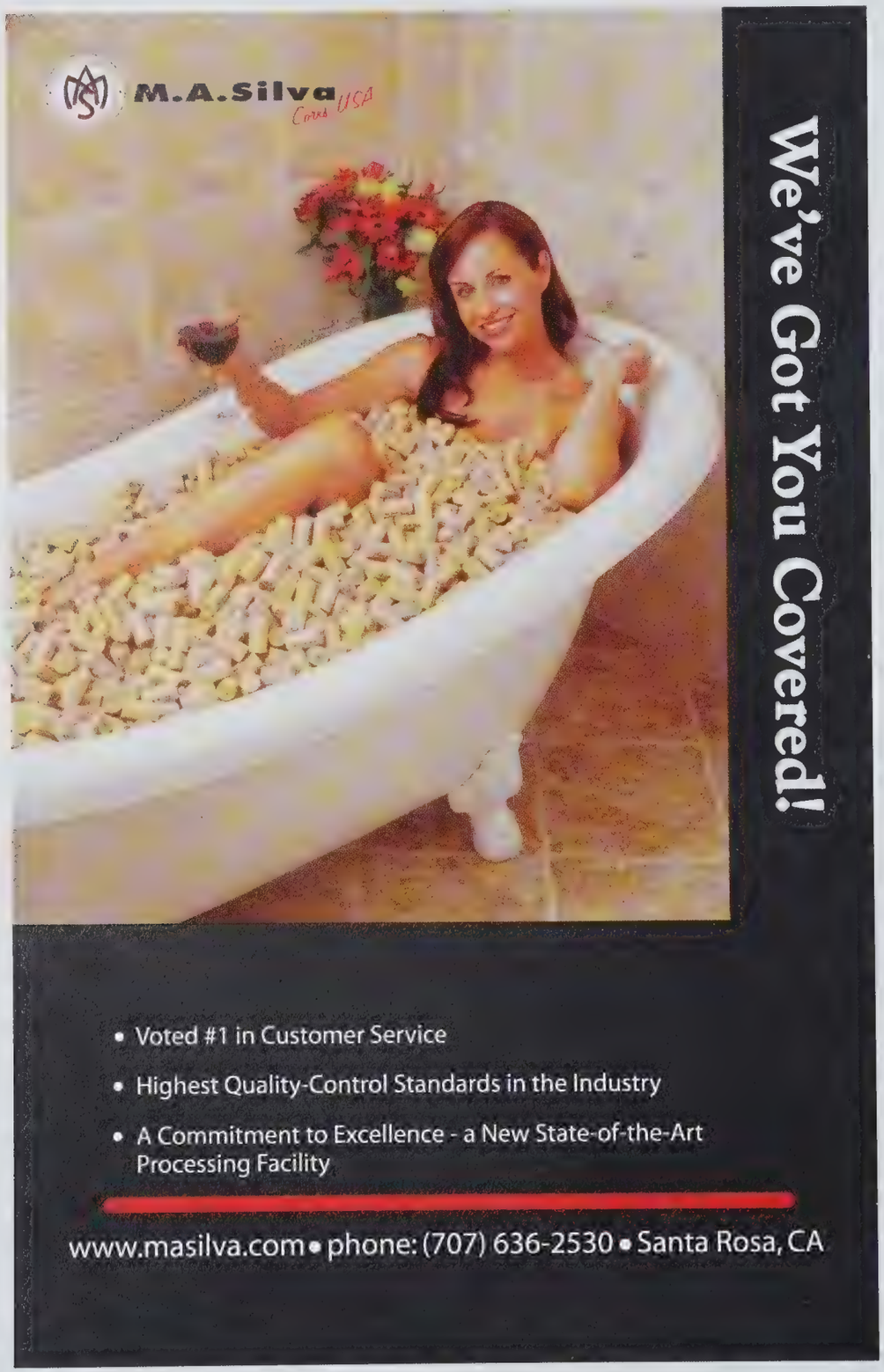
Oxygen ingress testing of most package types can be completed in one to six months. This is currently providing some wineries with a screening tool for selecting potential closures and packaging material suppliers. With this information, they only production-test closures that give the desired oxygen ingress rates and reliability they require, saving both time and money.





Establishment of total oxygen pickup information for existing package types allows the evaluation of new package types against bench-

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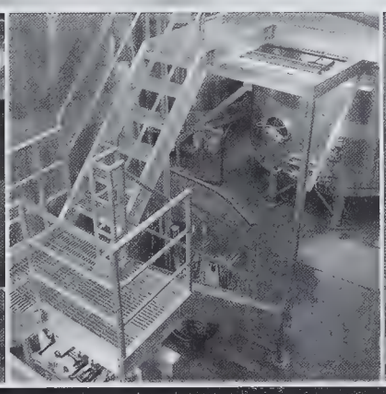
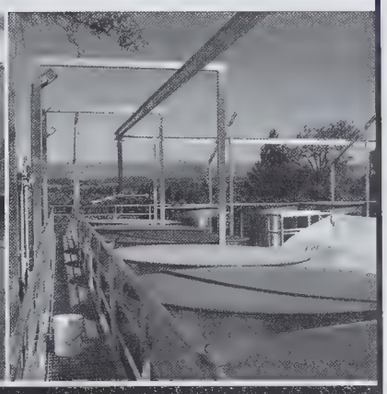

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mark targets prior to testing with wine, thus improving the likelihood of success.

Pressure must be placed on the closure and liner suppliers to improve the performance of their products; the results, to date, are unacceptable by any standard. While synthetic cork companies are focusing on oxygen ingress rates, they should also examine recovery rates.

Although wine is quite resistant to oxidation, improving the consistency of the oxygen exposure during bottling and in the package can only improve the bottle-to-bottle consistency of the wine. Working with controlled amounts of oxygen exposure may also allow winemakers to explore processes and products previously unforeseen.

In the evaluation of wine packaging and packaging processes, it is not so important that wineries are perfect and use the perfect closure, but that they 1) start the process to minimize variability on their bottling line with equipment and procedures, and 2) start evaluating the closures (or other packaging materials) for technical performance. They can then use that information to select the best suppliers and/or require that their suppliers improve their performance. The third step is to request packaging that allows only specified amounts of oxygen into the wine over time. ■

Figure IV: Oxygen Pickup during transfer, filling, closing and ingress as function of time (750 ml bottles)

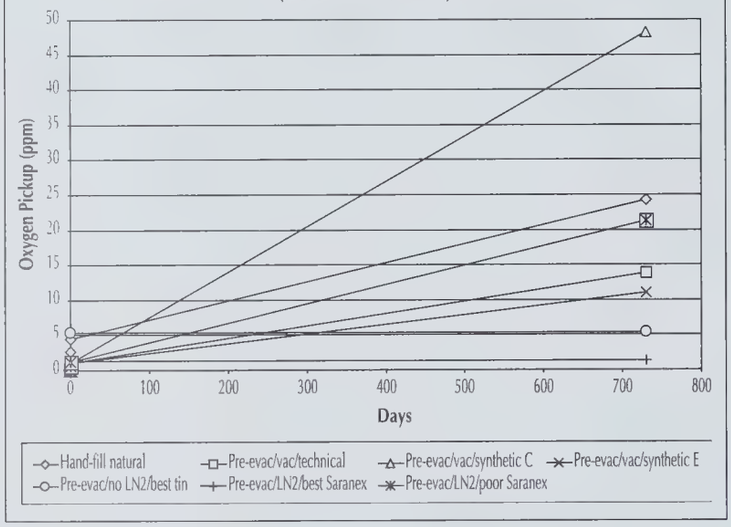
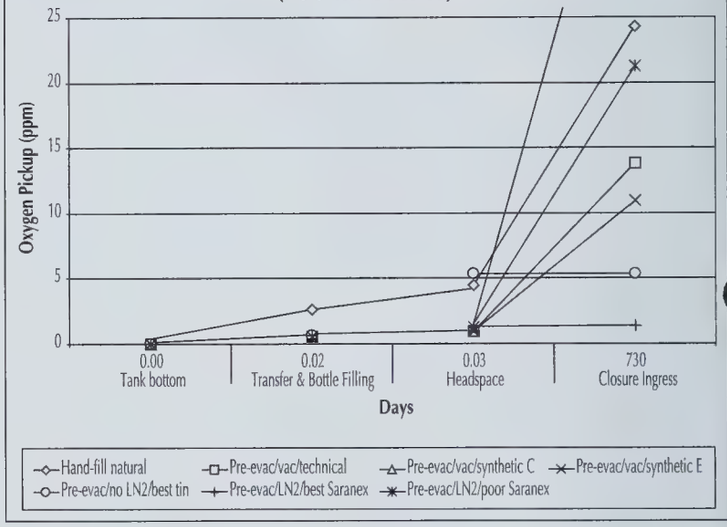


Figure V: Oxygen Pickup during transfer, filling, closing and ingress as function of process (750 ml bottles)



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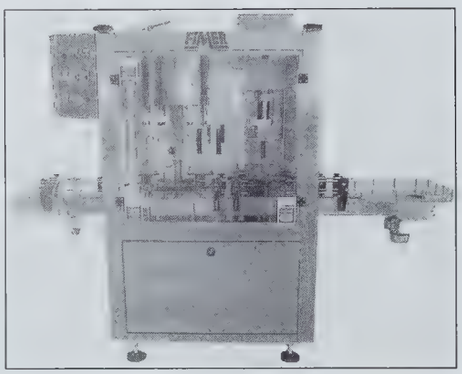

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HACCP-LIKE APPROACH

Quality points program for wine production

BY K.C. Fugelsang, Professor of Enology, California State University, Fresno, CA

Assuring quality through identification and monitoring of the critical points in the production process that must be controlled in order to eliminate or reduce the risk of a food safety hazard to an acceptable level can be achieved by implementing a Hazard Analysis Critical Control Points program (HACCP).

In an HACCP or HACCP-like program, responsibility for final product integrity (quality) resides solely in the hands of the producer (winemaker) responsible for the care, custody, and control (the "3 Cs") of raw materials, processing, and storage. As materials (grapes, yeast, fining agents, filter pads) flow into the system from suppliers, each passes their 3 Cs to the next holder (winemaker, distributor, consumer) in an adequately documented, accountability-guaranteed, safe condition.[10]

Historical development

HACCP is not a new program. It was developed by NASA and the Pillsbury Company in the 1960s, to meet the needs for food safety in support of the space program.[14] In its earliest form, the program focused on three goals: 1) hazard identification and characterization, 2) identification of critical control points (CCPs), and 3) monitoring to assess compliance with selected CCPs.[7]

Subsequently, the International Commission on Microbiological Specifications of Foods (1988) adopted three additional goals: 4) specification of criteria (components) at each CCP that must be monitored, 5) corrective action, and, 6) a plan to verify that the goals are being met.

The final component was established by the U.S. National Advisory Committee on Microbiological Criteria for Foods in 1989 which created seven) a system of documentation and record keeping. A modified version of the seven principles of the contemporary HACCP program is diagrammatically presented in Figure I.

Since its establishment, HACCP has been endorsed by the National Academy of Sciences, the National Advisory Committee for Microbiological Criteria for Foods, and the Codex Alimentarius Commission (1991, 1997) as the most effective means available to minimize the risk of contamination in food products.[11]

Agricultural products and food (including wine) must now comply with regulations set forth under the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Tax & Trade Bureau 2005). Briefly, the Bioterrorism Act (BTA) authorizes the Secretary of Health and Human Services, acting through the Food and Drug Administration (FDA), to issue regulations to protect the U.S. food supplies against bioterrorism and food-borne illness. The regulation affects TTB-regulated industry members including bonded wine premises, breweries, distilled spirits plants, alcohol beverage distributors, importers, warehouses, and wholesalers (www.ttb.gov/bioterror-law.htm).

BTA compliance requires that 1) the facility register with the FDA, and 2) owners/operators develop and maintain processing records subject to FDA inspection. It also requires importers to notify the FDA via the Bureau of Customs and Border Protection (CBP) prior to importation of food (wine) into the U.S.. Those products from unregistered facilities or imported into the U.S. without prior notice are subject to detention or refusal of entry. The FDA can detain product if there is credible evidence that it poses a threat.

Table I. Example of a simplified critical component analysis for wine production

Vineyard sampling: Maturity °B, TA, pH, rot and other deterioration, OTA, polysaccharide instability, YANC, ArgOPA (ethyl carbamate potential) chemical formulations (i.e. elemental sulfur)

Crushing/pressing: Fruit grading, temperature, SO_2, enzymes

Juice/must: Sensory, °B, pH, NSS, YANC, TA, SO_2, T°C, enzymatic oxidation. Cold soak (reds), native species, EToAC formation, VA.

Fermentation: Sensory, yeast (strain, inoculant volume, % budding, % viability, purity), T°C, fermentation rate, nutritional program, acetic acid, volatile emissions control

Free Run and Press Fractions: Sensory, tannin, color, MLF (strain, inoculation volume, purity)

Finish fermentation: Sensory, °B, RS, pH, TA, alcohol, MLF status, oxygen (micro-oxygenation), SO_2, protein and tartrate stability

Clarification: Sensory, oxygen, protein stability, tartrate stability

Maturation: Sensory, oxygen (oxidation), SO_2, MLF status, *sur lie*, *Brettanomyces*, oxidative yeast/bacteria

Blending: Sensory, physical, chemical, biological stability

Bottling: Sensory, fill level, SO_2, dissolved oxygen, MLF, RS, microbiology, packaging materials QC

Ageing: Sensory, storage temperature, temperature fluctuations, ethyl carbamate, biogenic amines (reds), release date

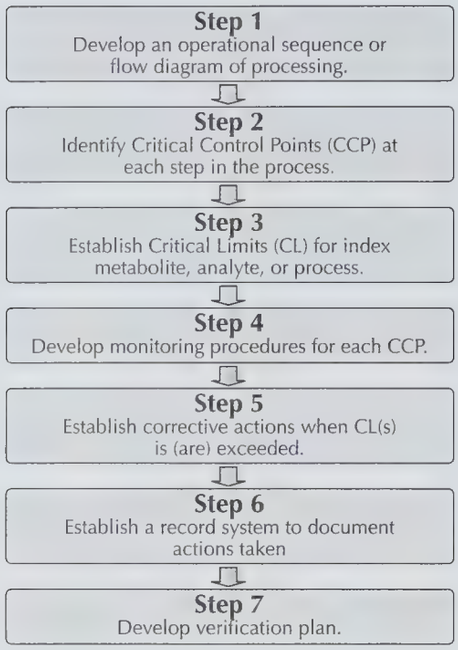
Step 1
Develop an operational sequence or flow diagram of processing.
Step 2
Identify Critical Control Points (CCP) at each step in the process.
Step 3
Establish Critical Limits (CL) for index metabolite, analyte, or process.
Step 4
Develop monitoring procedures for each CCP.
Step 5
Establish corrective actions when CL(s) is (are) exceeded.
Step 6
Establish a record system to document actions taken
Step 7
Develop verification plan.

Figure I. Abridged example of a seven-step quality points program. (Adapted from Fugelsang and Edwards 2006.)

HACCP represents one tier in a general management pyramid (see Figure II). Arising from the much broader concept of Good Manufacturing Practices, HACCP is a focused program that addresses food safety. Common to both is the approach that food safety should be viewed in a proactive, rather than reactive ("produce and test"), mode.

Integrating HACCP into the all encompassing framework of Total Quality Management (TQM) is facilitated when other quality assurance (certification) programs, such as those of the International Standards Organization (ISO 9001/03), are already in place (ISO/DIS 15161, 1998; AS/NZS 3905.13, 1998).[12]

HACCP programs are currently being implemented in the international wine community. New Zealand wineries are now required to develop HACCP-based management

TOTAL QUALITY MANAGEMENT
Certification programs: (ISO 9000–9003)
HACCP-like approaches — quality points program
Good manufacturing practices
Winery operations and standards

Figure II. Operational Management Pyramid

plans (Wine Standards Management Plan). Winemakers must maintain and manage record-keeping, traceability, ingredients, and sources of all components added to the wine. Records and documentation are subject to yearly audit.

Recognition of the program's merits has been slow in the U.S. The extent to which the U.S. industry is aware of changes in regulations is demonstrated by several recent informal polls where (collectively) only

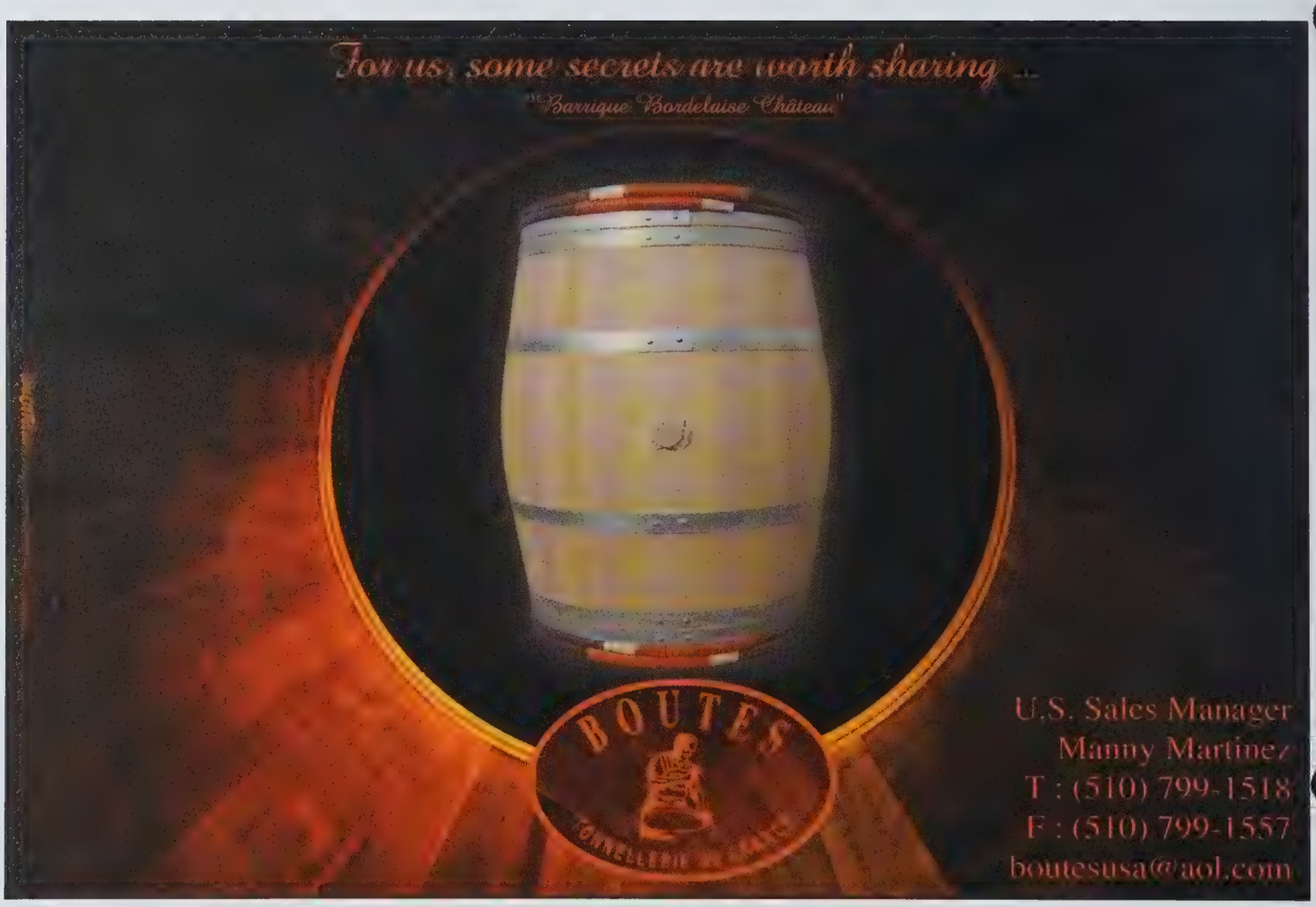

Table II. Methods and Precision Limits — Some Examples (Zoecklein, *et al.*, 1996)

Method	Precision Limit
TA	± 0.2 g/L
Alcohol — ebulliometry	± 0.1% (v/v)
Formol titration for N	2–3%
Sulfur dioxide — AO (free/bound)	± 1 mg/L
Sulfur dioxide — AO (total)	± 2 mg/L
Bitartrate stability — Conductivity	± 0.1 (%)
pH	0.1
Residual sugar	0.1 % (w/v)
VA	0.1 (g/L)

seven of over 400 winemakers and grape growers had heard of HACCP and, among those, only five realized that it pertained, in any way, to their operations (Fugelsang 2005–06, personal observation). Aside from a few commentaries in the popular press and technical journals, there clearly has been an information vacuum in terms of regulations that may have significant repercussions.

While a wider understanding of the merits of HACCP-like programs has been slowed by dissemination issues, another significant hurdle is the notion that the program is too cumbersome and development/implementation is overly onerous. To satisfy both concerns, Charles Edwards and I have proposed and advocated the adoption of a Quality Points Program (QPP) that accomplishes these goals using HACCP-based principles (2006).

As seen in Table I, a simple and concise Quality Points Program can be developed by simply writing down and evaluating control points that winemakers are already aware of. Once established, the QPP will provide the basis for just about any situation in wine production.

Once a winery implements a Quality Points Program, it must not only be able to establish control points, but also have the capability to monitor and control those of concern.[15] Following is a modified version of the "Seven Principles of the HACCP System" established by the Codex Alimentarius Commission's Committee on Food Hygiene (1997):

Step 1 — Develop an operational sequence or flow diagram, beginning with the raw material (grapes) and continuing through the process to bottled wine, case goods storage, and, if necessary, beyond. As can be seen in Figure I and Table I, the document may be more or less complicated depending upon facility design and objectives.

Step 2 — Conduct an analysis of each step in the processing flow chart

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and identify potential quality junctures, or Critical Control Points (CCPs), that may adversely impact quality. To aid in identification of CCPs, one can utilize a decision tree as seen in Figure III (modified from the Codex General Requirements, 1995). Each CCP should be ranked in terms of importance and each Quality Factor (QF) that must be controlled should be identified. Quality Factors may be physical (such as packaging or cork dust in bottled wine), chemical (pH), and/or microbiological (*Lactobacillus* contamination). A protocol for monitoring each QF must also be in place. These are usually embodied in Standard Operating Procedures (SOPs).

Step 3 — Establish maximum/minimum limits, or Critical Limits (CLs), for each QF and expected analytical precision for each index metabolite or analyte identified (see Table II). In general, "classic" measurement of microbiological populations are avoided as CLs because results are commonly not available for days or weeks and, hence, lose their value in a proactive program. As "real-time" methods evolve, monitoring species density and diversity will play an increasingly important role as CLs.

Step 4 — Develop rapid, accurate, and cost-effective monitoring procedures for each QF that include identification of specific analyses and the frequency of measurements needed to assure that the QF is under control. Also included here is a system of records to document any action taken at that juncture. Various analytical and microbiological methods are available to facilitate the monitoring component.[16]

Step 5 — Establish corrective actions to be taken if a QF's measurements/analyses deviate from established CLs. Examples may include the addition of nitrogen adjuncts, adjusting fermentation or storage tank temperature, or the addition of SO_2.

Step 6 — Establish procedures for record keeping and documentation including instrument and equipment calibration records. A suitable tracking system should also be established so that a winemaker can, if necessary, trace a specific bottle of wine from the vineyard to the marketplace. In every case, monitoring data should be recorded by the individual taking the measurement, at the time when the measurement is taken. All records should be reviewed before any product leaves the facility.

Step 7 — Develop a verification plan to demonstrate that the Quality Points Program has been effectively implemented and monitors selected QFs. Verification includes a variety of

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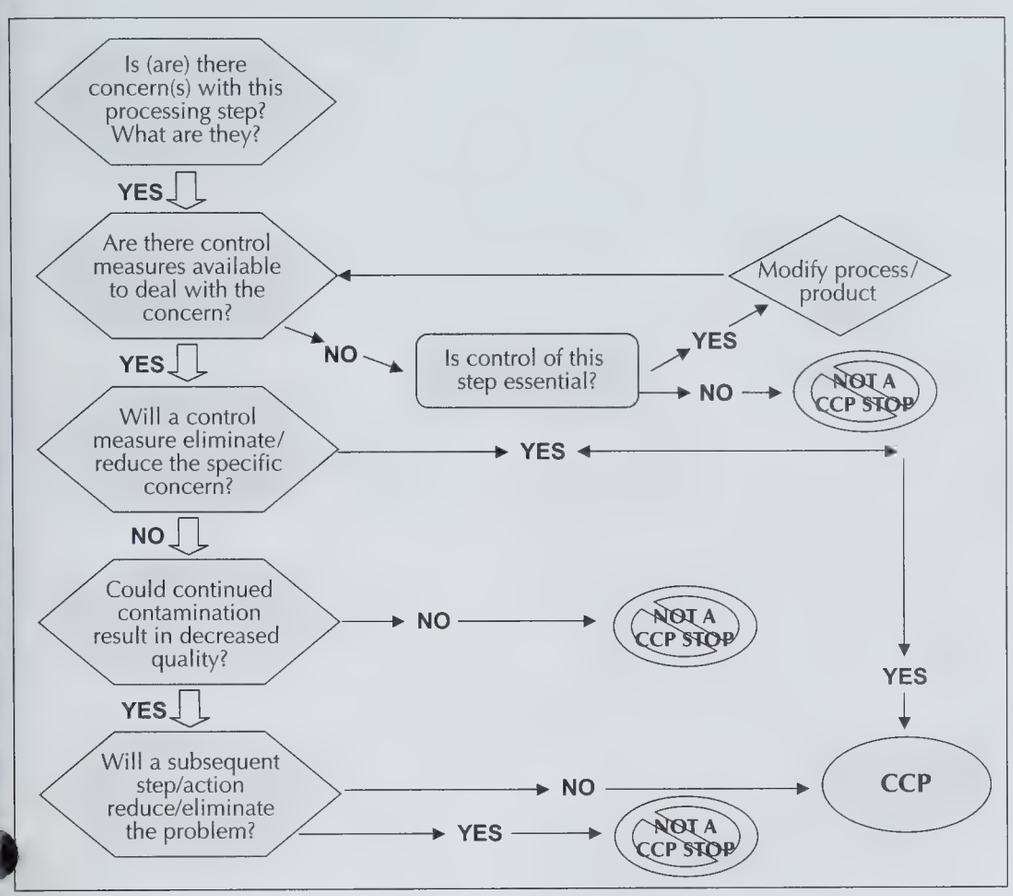

Figure III. Decision tree for identification of critical control points (CCP) in processing. (Modified from Codex *Alimentarius*.)

elements such as calibration of equipment and instruments used in monitoring, analytical testing, and microbiological samples, validation of experimental test methods; and a protocol for record review. Verification is conducted when a plan is first adopted, and then is reviewed and modified when quality factors change, and again prior to the next vintage.

Conclusions

Design and implementation of an effective Quality Points Program has several practical advantages for the winery staff. First, and most importantly, it is proactive — at each step in the process, those chemical, microbiological, and physical challenges that can negatively impact wine quality are identified. It also establishes protocols for monitoring and dealing in advance with variance from established limits. Embracing the program requires a thorough evaluation, and intermittent re-evaluation, of the production process.

Secondly, HACCP-like plans, such as a Quality Points Program, are recognized internationally by regulatory and trade organizations, retailers and, increasingly, consumers. Global marketing of wine will necessitate compliance to remain competitive.

As traceability in the food processing chain becomes more important in the 21st Century marketplace, having records of source, control, and distribution is more critical than ever before. An operational Quality Points Program represents an important first step in dealing with what will surely become a more significant compliance issue. ■

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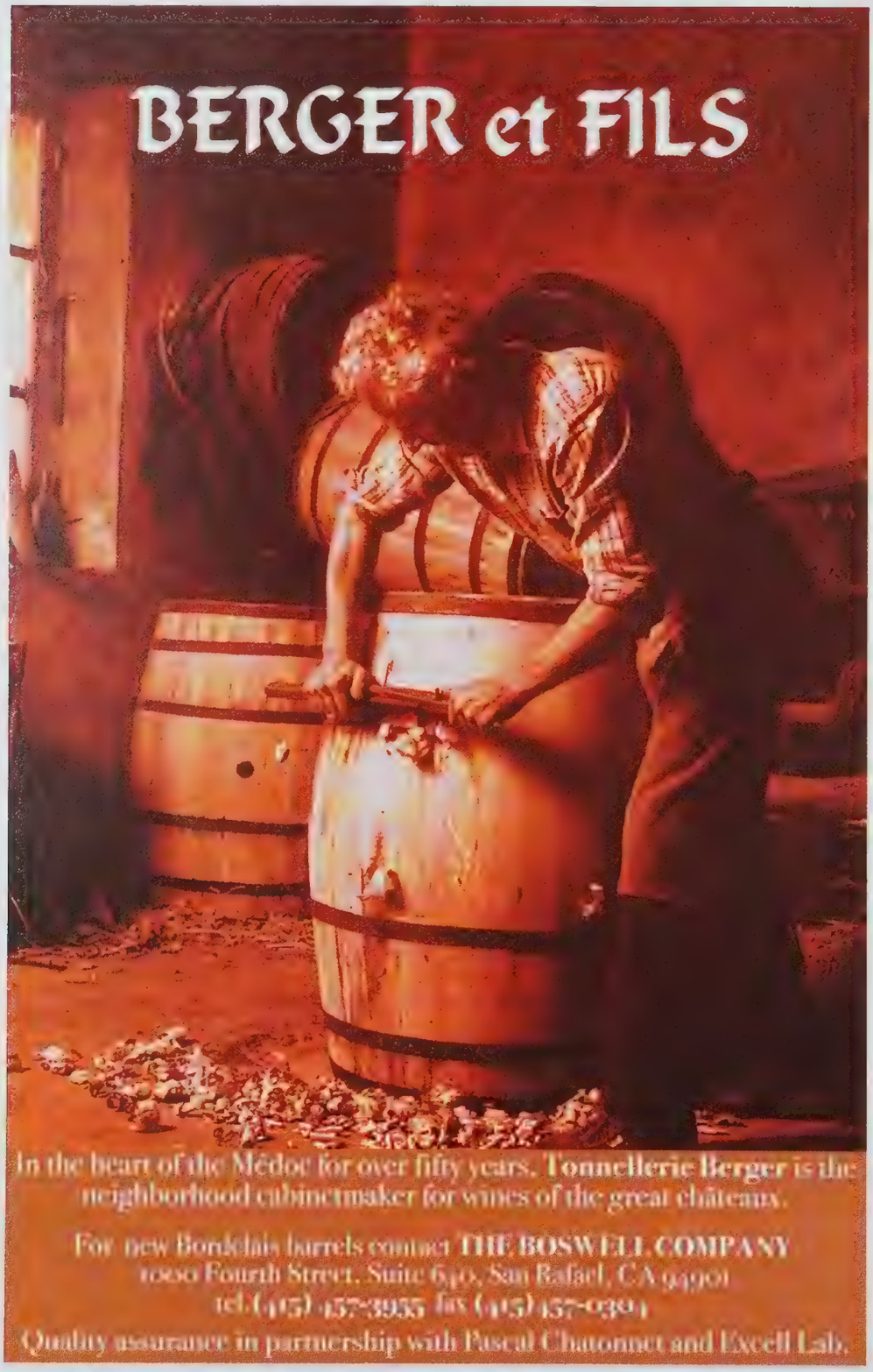
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A greenhouse full of green-grafted vines just prior to being placed outside to be hardened off for vineyard planting. (Photos provided by Duarte Nursery)

Vine and planting options for vineyard development

BY Fred Peterson,
Peterson Winery, Healdsburg, CA

When I began working in California vineyards over 30 years ago, the choice of what type of nursery stock to plant was pretty simple. If you were in the Central Valley and root knot nematodes were not already a problem, you most likely planted own-rooted cuttings. If you were planting a vineyard in the North Coast, you either planted a rootstock rooting (either AXR-1 or St. George), or if you had planned a year in advance and had the money, you planted field-grown, dormant bench-grafts.

Regardless of the type of nursery stock used in a planting, it was very important that planting occur in the early spring. This would allow the plants to establish sufficient roots to supply the vine with water and nutrients after they had leafed out. Keep in mind that this was before the widespread use of drip irrigation.

Vine irrigation was done by furrow/flood or sprinklers in the Central Valley, and by sprinklers in the North Coast — either solid-set or movable pipe on the valley floor. In the hills or where water was scarce, hand irrigation from a tractor-pulled water tank was the only way to deliver water to a new planting.

Introduction of drip irrigation in the mid-1970s revolutionized many vineyard practices, especially the development of new vineyards. The ability to water on demand with very little labor or effects on cultural or disease control practices meant vines could be planted later in the year with much less risk of plant stress. Drip irrigation created a brave new world for vineyard owners/managers and grapevine nurseries.

Below are various types of grapevine nursery stock produced and some pros and cons of their use.

Rootstock rootings

Rootstock rootings are almost always field-grown and sold as dormant plants, either directly from the nursery in late winter or early spring, or out of cold storage in late spring or early summer. As with dormant bench-

Matching the scion and rootstock size when grafting is a crucial step in producing grafted vines with complete and strong graft unions. Shown are V-cut scion and rootstock pieces before being joined and taped.

grafts, rootstock rootings should be planted as early in the spring as soil conditions allow.

Planting dormant rootstock rootings after the beginning of June greatly increases vine mortality and generally decreases vigor and growth. Traditionally in the Central Valley and North Coast, these would be planted late March/early April, with the hope of enough spring rains to carry the plants through May before they would require irrigation.

"Fall budding" would be done as soon as mature budwood canes from the desired mother vines could be obtained, typically mid-August to mid-September. Besides the obvious skill required of the budders, having actively-growing plants, fresh/mature budsticks, and at least two weeks of warm, dry weather after the budding was done were all essential to a high percentage "take."

In addition to the obvious caveat that the budwood be taken from virus-free mother vines of the proper variety/clone, it is important the budwood be kept cool and moist and be used within a couple of days of being cut. If the plants stopped growing or had not achieved sufficient size, the budding would be postponed until the following spring, using dormant budwood which had been placed in cold storage.

The crucial management decision for spring budding (chip-budding) was budding as early as possible, in the spring, but after the weather had turned warm and without much likelihood of rain. These requirements could be problematic on the North Coast.

Though rootstock rootings are less than half the cost of any grafted plants, the additional costs of field budding and associated hand labor, when combined with the greater management requirements and risk, make this approach less desirable today, especially given the availability of excellent quality, reasonably-priced bench-grafted vines.

For a grower willing to take on the additional risk and management, planting rootstock rootings does spread out a portion of the establishment costs and it gives the grower additional time (as much as one year) to decide what variety/clone to graft. This can be very important if you're planting a vineyard without a pre-plant contract.

Field-grown, dormant bench-grafts

These vines were grafted in the winter (usually at a bench in a nursery), callused (the union of scion/rootstock) in the spring, and planted out in a field in rows. After one growing season in the nursery, the plants would be dug that winter, sorted, graded, and bundled. The vines would then be either heeled in sand or put in cold storage until planted.

Field-grown bench-grafts have the obvious advantage of having established a solid graft union and a well-

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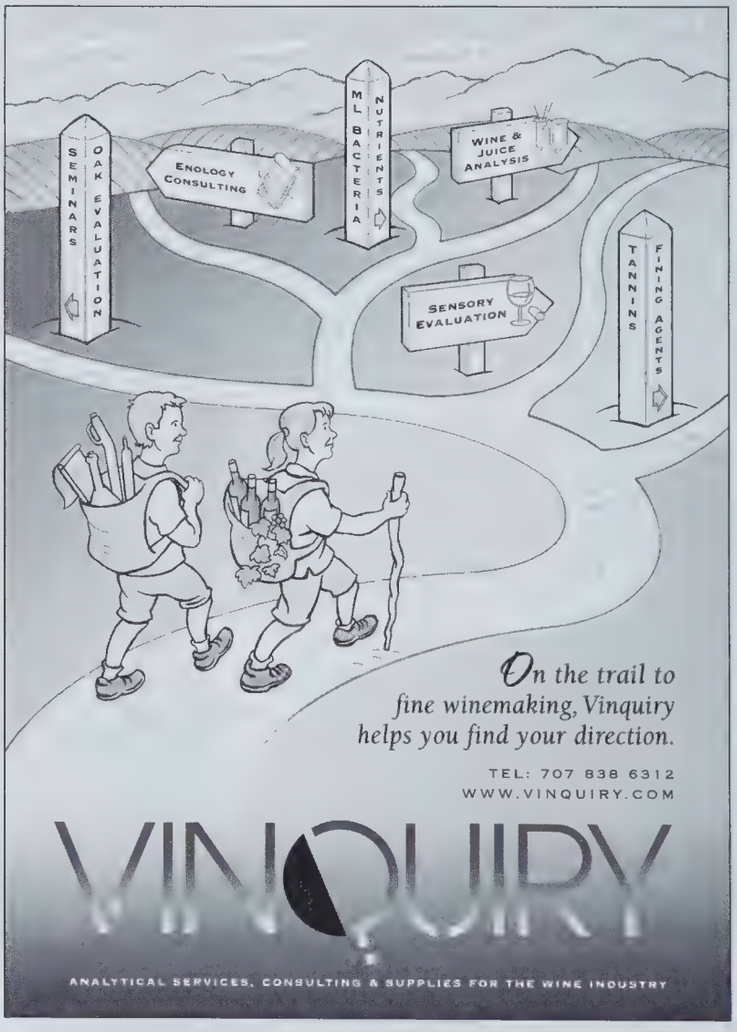

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developed framework of roots prior to being planted in a vineyard. Because of the significant additional labor and expense to grow these grafts in the field for one year, nurseries typically produce very few of these vines without a written contract from a prospective grower, usually with a deposit required. This requires that the grower select the scion/rootstock combination and the number of vines to order at least 15 months prior to actually planting of a vineyard.

In planting field-grown, dormant bench-grafts, one important consideration should be how quickly the vines can be planted in the spring. Though two to three months of proper cold storage won't harm the plants, for every week in cold storage past April the viability decreases and the potential for transplant shock increases.

If a vineyard owner wants to achieve the maximum benefits from planting dormant bench-grafts, all soil preparation and any installation of underground drainage and irrigation mainlines must be completed by early fall, depending on growing area. This allows planting to occur before summer, even in years with late spring rains.

Bench-grafts, green-growing/dormant

The first green-growing bench-grafts were spindly, delicate-looking little vines growing in wax paper tubes. When planting these vines, we were concerned about tearing enough of the wax paper tube so the roots could grow laterally without breaking too many roots.

Today, green-growing vines are allowed sufficient time at the nursery to obtain adequate root and shoot growth prior to being shipped as ready-to-plant. The larger the sleeve or tube that the vines are grown in, the greater the root mass that can be obtained prior to planting in a vineyard, and the more quickly the vines will begin shoot growth and achieve considerably more growth than a vine with a less-developed root system.

Bench-grafts grown in containers have many advantages over their field-grown cousins. First, they have not been grown in a field in soil that might have become infected with soil-borne pests and/or pathogens. Ideally, they are grown in a sterilized, specially formulated planting mix to maximize root development for the young grafts.

The second major advantage is that green-growing bench-grafts are not subjected to being placed in cold storage and to the artificial dormancy that it imposes on plants. Planting green-growing bench-grafts allows the vineyardist to plant his vineyard anytime from late spring when that year's green grafts are ready for planting, through the summer.

Fall planting, though traditionally not done much in California

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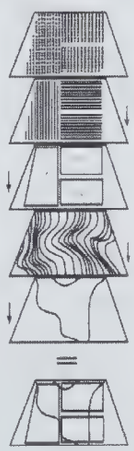

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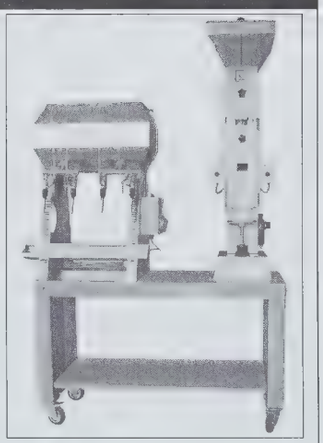

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grape growing, is one use of green-growing vines that has good possibilities in areas where early fall frosts are not a factor. Once a green-growing bench-graft has gone completely dormant in the winter, it is basically the same as a field-grown bench-graft in terms of root development and potential growth when planted in the spring. Again, these plants don't have the potential downside of cold storage.

Even after leafing out in the spring, one-year-old green-growing vines will take root and begin growing immediately, provided that a drip system is operating and proper soil preparation was done.

With green-growing vines, proper hardening of the plants in the open air is very important. Taking green-growing plants directly from a temperature- and humidity-controlled greenhouse and planting immediately in a field is a recipe for disaster.

Preparing to plant

Whether planting or replanting, a vineyard is both figuratively and literally developed from the ground up. Having a thorough understanding of your soil and site is crucial to developing the best vineyard possible for that location. This includes soil depth, structure, chemistry, drainage, and erosion potential.

It also includes a previous crop history for the site and a thorough nematode screening. Talk to the viticulture farm advisor and nearby grape growers to learn what has worked in the area. Even more important, what has not worked well and what they would do differently in future plantings.

In 15 years of replanting vineyards on AXR-1 rootstock to phylloxera-resistant rootstocks in Sonoma County, I have become aware of many good phylloxera-tolerant choices, but very few nematode-tolerant choices.

As vineyards in the North Coast are replanted, soil/site preparation is very important. With the phase-out of methyl bromide as a pre-plant fumigant and the desire to use softer chemicals in vineyards, it is increasing difficult to avoid the "replant syndrome" by going immediately back into ground with grapevines where the previous crop was grapes.

The most important operation in replanting is to do a thorough job of removing old grapevine roots. After removing the vines themselves (preferably using a method that removes the root crown and larger roots with the trunks), the best way to remove most root-pieces is to deep-plow the field with a large enough crew to keep up with the plow, and a tractor with trailer to haul roots to a burn pile.

Fallowing a field for a couple of years with appropriate cover crops is the best method for reducing pest/pathogen populations. However,

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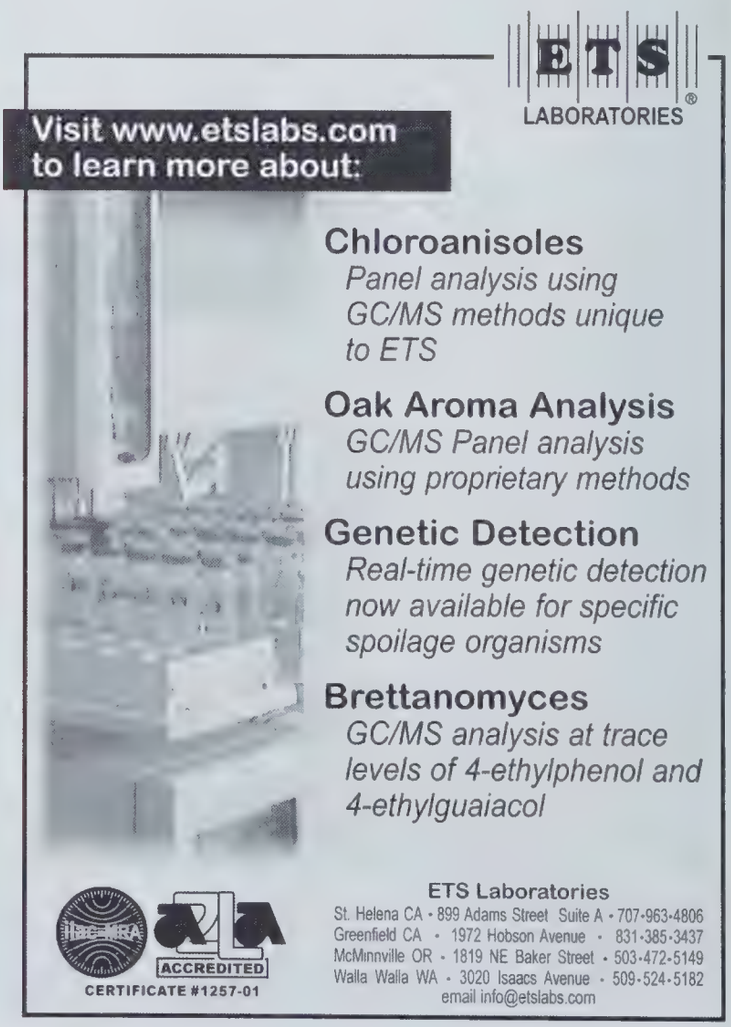


A green-grafted vine with desired root development for planting in a vineyard.

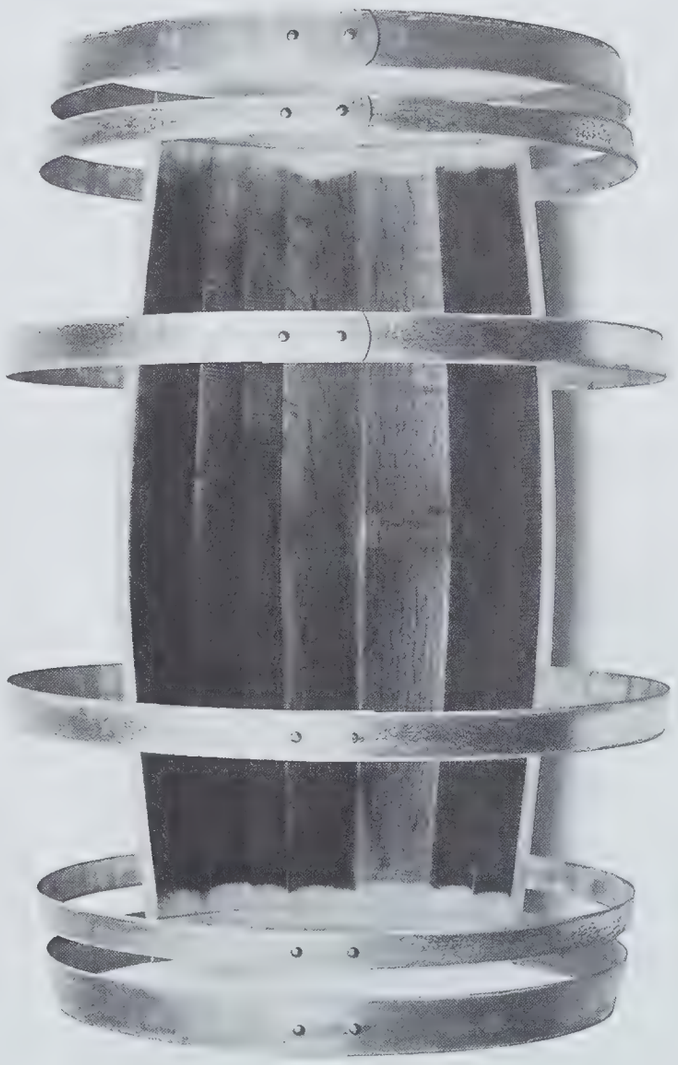
most growers can not afford to leave the ground out of production that long. Amending the soil with whatever nutrients are marginal, and either lime or gypsum if necessary, is best done during soil preparation.

Once you decide what type of planting material and what scion/ rootstock combination(s) you will use, you will need to choose a nursery from which to order the vines. There are many factors that should affect this decision. First and most important is to only work with nurseries that are well established and that have a reputation for producing high-quality, disease- and pest-free vines.

It is a good investment to take time to tour prospective nurseries. Ask questions about procedures and practices in the grafting and care of newly-grafted plants. Pay particular attention to sanitation practices used and the general cleanliness of the facility, especially the grafting room.

Some nursery practices that will lead to better quality vines include the proper matching of the scion diameter to the rootstock diameter. A good match will allow complete callus development and subsequently a strong graft-union.

Does the nursery use a hot-water dip and a preventive insecticidal treatment to prevent introduction of pests, especially the vine mealybug, into your vineyard? What are the protocols for testing plant materials to ensure they are free from known pathogens



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and pests? Does the operation appear organized and managed well?

Is the nursery capable of working with you in being able to hold vines until the vineyard is ready for planting and the vines are fully developed? This flexibility of the nursery can be crucial in maximizing future vine growth and health. Does the nursery's field representative bring sufficient expertise to help you achieve your goal?

Unlike almost all other costs associated with vineyard development, the cost of vines has increased very little in the last 25 years. However, greater plant densities are much more common in the North Coast, and the number of vines per acre has, at a minimum, doubled from early 8 x 12 (454 vines per acre) trellised plantings.

In many vineyards, planting densities have tripled or even quadrupled. This not only makes the cost of the vines a larger expense, but the labor of planting and hand-vine care needed to ensure desired growth from the vines becomes a larger portion of the total development cost. Therefore, the choices of what and when to plant are even more crucial.

Summary

Viticultural technologies and techniques have evolved a great deal in the last 20 years, allowing much more choice in how and when a vineyard is planted. However, along with the increased flexibility have come much greater costs to develop an acre of winegrape vines and a much smaller margin for those who don't do it well.

Using the best available plants and plant materials is certainly among the most important decisions a grower/vineyard manager makes in developing a new planting. However, these vines must be integrated with the proper site evaluation and soil preparation in order to maximize the vineyard's potential. Though much has changed in vinegrowing in the last couple of decades, the basic horticultural realities of plants, climate, and soil is pretty much the same as its been for millennia. ■

After receiving a Viticulture/Enology degree from U.C. Davis in 1978, Fred Peterson has held a number of winegrowing positions including winemaker/general manager at Mount Eden Vineyards (Saratoga, CA), and vineyard manager for Ridge/Montebello Vineyard (Cupertino, CA). In addition to managing Peterson Winery estate vineyards in Dry Creek Valley (Healdsburg, CA), and various vineyard consulting on 650 acres over 16 years, he is the Duarte Nursery field representative for Sonoma County and Anderson Valley.

CARDIOPROTECTIVE ABILITIES OF GRAPES

No whine with white wine

BY Dipak K. Das and Sumi Das
Cardiovascular Research Center, University of Connecticut School of Medicine, Farmington, CT

With a 7,000 year old history, alcohol — and especially wine — has long been used for medicinal purposes. The Bible mentions medicinal use of wine almost 200 times.[1] What has led us to stray from this idea of alcohol being beneficial after all?

We live in a society that is constantly challenging every decision we make: Yes or no? Good or bad? Should we or shouldn't we? American society remains well known for preaching alcohol consumption as bad behavior — an indulgence and a pleasurable sin. In the early 1990s, news of the "French Paradox" poured into the media. Since then, we are beginning to believe once again that moderate alcohol consumption actually *can* be quite beneficial.

To recap the "French Paradox" — the French are known for their consumption of fat, consuming four times the amount of butter, three times the amount of pork and about 60% more cheese than the average American.[2] Yet they have a lower rate of coronary heart disease than Americans. The gap is filled through the trend of high red wine consumption in France, a finding reported on *60 Minutes* in 1992, showing that moderate alcohol consumption can reduce cardiovascular disease by up to 50%.

Drinking wine moderately has already been proven to cause fewer heart attacks and strokes. The consumer is generally less likely to suffer hypertension, Alzheimer's disease, peripheral artery disease, and more likely to be protected against many other ailments. The French, thanks to their red wine consumption, have 40% fewer heart attacks than Americans.

But is one type of wine in fact better than another? What makes red wines any better than white wines? Could it be that red wine has more antioxidants than white? Although many people quickly jump to the conclusion that red grapes hold the key to more health benefits, the truth is that grapes of various colors have similar and analogous advantages.

In previous studies, cardio-protective compounds in grapes, known as polyphenolic antioxidants, have been found in grape seeds and grape skins. A powerful antioxidant, anthocyanin, is found in significant amounts in red grape skins, and since these grapes are crushed whole when being made into wine or juice, the result is that the anthocyanins are directly conveyed into the wine.

Since the process of making white wine involves separation of the skin from the grape pulp, the customary belief is that red wines are healthier for the heart than are white. However, recent studies now show that the pulp of grapes appears to be equally beneficial for the heart as the skin of the grapes.

To prove this, a group of researchers from the U.S. [Dr. S. Das and Dr. J. Cui, and headed by Prof. D. K. Das, University of Connecticut School of Medicine], and Italy [Prof. M. Falchi, Prof. A. Bertelli, Dr. R. Lo Scalzo, Dr. M. Morassut, and Dr. R. Morelli at the University of Milan], initiated a study in 2005 using laboratory animals. The animal study was performed at the University of Connecticut School of Medicine while the analytical chemistry (identification of the antioxidants) was done at the University of Milan. The study was completed in approximately six months (September 2005–March 2006).

The researchers assigned male Sprague Dawley rats at random, to receive one of three different preparations with dietary supplements.[3,4] The three preparations included: a control group receiving water only, a group receiving grape flesh extract, and a group receiving grape skin extract. Researchers used a 50/50 mix of white and red grapes.

After 30 days, the hearts of the rats were subjected to injury to reduce blood flow and cause heart attack. Concentrations of Malondialdehyde (MDA), a reactive carbonyl compound used as a marker of oxidative stress, increase under such conditions.

Results showed that in comparison to the rats used as the experiment control, the rats that were fed either the grape flesh extracts or the grape skin extracts had significantly reduced severity (about 30% to 35%) of heart attack. The groups receiving the grape flesh compared to grape skin extracts showed no variation. As for the MDA levels, observations showed that they were about 50% lower in the grape flesh and grape skin extract rats also, in comparison with the control rats.

Although no anthocyanins were found in the grape flesh, researchers have found that it did consist of other cardio-protective antioxidants. High concentrations of caftaric acid, coutaric acid, and caffeic acid have been observed. Due to the fact that attention to date has been more closely paid to the grape skins and seeds because of their abundance of resveratrol, less attention has been directed toward research with the grape pulp, its antioxidants, and their cardio-protective properties.

The results of the study demonstrated that both the grape skin and flesh could protect hearts from

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ischemic reperfusion injury (damage to heart muscle cells due to poor or blocked blood flow) and present studies are examining whether grape pulp possesses any other cardio-protective abilities. Although further study is necessary to help identify the key ingredients responsible for the cardio-protective abilities of the grape flesh, these studies provide the first evidence that the flesh is indeed as cardio-protective as the skins.

With the vast amount of data that has accumulated regarding health benefits from alcohol consumption, the choice remains as to which to pick: Chenin Blanc, Chardonnay, or Cabernet Sauvignon? Whichever a consumer chooses, the beneficial effects provided by wines are sure to please, with a healthier heart and a prolonged life to follow. It can be best said by a popular Italian proverb: "One barrel of wine can work more miracles than a church full of Saints." ■

Dipak K. Das, Ph.D. is the professor/director of the Cardiovascular Research Center at the University of Connecticut School of Medicine, Farmington, CT. Over the last 30 years, Dr. Das's research has focused, among other things, on nutrition and healthy heart. His study documented cardioprotective effects of grapes, red wine,white wine, and their polyphenolic antioxidant components, such as resveratrol.

The full scientific paper and results of the Das et al study, can be found in the Journal of Agricultural & Food Chemistry, 2006 Sept 6; 54(18): 6613–22.

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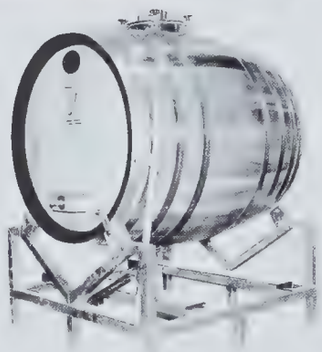

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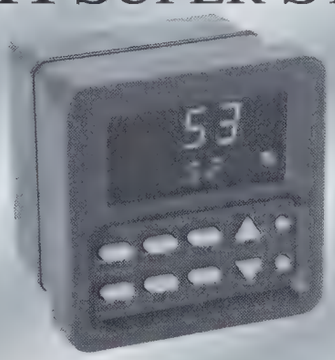

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PILOT NURSERY PROGRAM 2006

New CDFA program offers better control of GWSS

BY Tina Vierra

Control of the glassy-winged sharpshooter (GWSS) in California has been managed by nursery visual plant inspections since the summer of 2001. The California Department of Food and Agriculture (CDFA)'s Pierce's Disease Control Program estimates that the inspections are effective in 99.93% of cases, and that the grape growing industry has been satisfied with these results. In spite of this, the CDFA continues efforts toward a 100%-effective control system.

"When the visual inspection program was first established, we saw it only as a stopgap measure until we could come up with something better," recalls Bob Wynn, CDFA's statewide coordinator for the Pierce's Disease Control Program. "We now have nearly two years of testing with real world conditions on the improved system, and the results have been excellent."

The new system relies on spraying all plants before shipping with either Fenpropathrin (Tame) or Carbaryl (Sevin), instead of the current manpower-intensive visual inspections at both point of origin and destination.

The new system was first tested in field trials. In June 2005, the CDFA provided funding and administration to test it in a pilot program. Three nurseries participated in 2005, sending plants from three originating counties (Los Angeles, Orange, and Ventura) to two destination counties (Sacramento and San Joaquin).

"All plants showing egg masses were treated before shipment, and any GWSS egg masses were sleeved on the plant," says Greg Morris, program supervisor with the CDFA. "Once the plants arrive at destinations in Northern California, they are monitored for a minimum of 14-21 days. Not one single GWSS has survived."

To date, only nurseries shipping ornamental and landscape plants have participated in the pilot program. Other types of plant stocks, such as bare root and cutting providers, have not been part of the pilot program.

"The program is driven by where the egg masses are found in the ship-

Shipping nursery personnel place a bag over a treated plant.

CDFA inspector examines an egg mass to judge if treatment killed the eggs.

Bagged plant.

ping nursery," Morris explains. "There are 250 potential host plants for GWSS in California. Plants containing egg masses can become part of the pilot program shipment."

Norman's Nursery (headquarters in Los Angeles County), is both a shipping and receiving nursery in the program. Vice president Nancy Webb (in Los Angeles County), is in charge of the shipping end, with operations manager Barbara Hayes in charge of receiving in the company's San Joaquin County facility.

In this program, the shipping nursery assembles host material containing egg masses (10–40), and inspects them. County Agricultural Inspectors conduct a second inspection, verifying egg masses found, and witness a treatment of either Tame or Sevin. A blue tag (shipping permit) and a Certificate of Quarantine Compliance (CQC) accompany the shipment. The CQC contains the sleeved plant material information (plant species and number of egg masses) and the type and date of the chemical treatment.

In the receiving facility, San Joaquin County agricultural inspectors will inspect the plants, as they are off-loaded. The pilot program allows up to 40 egg masses per shipment to enter a county, but Hayes reports the most she has received so far, is 10 in any given shipment.

Blue-tagged plants are isolated, housed, and watered until the masses are confirmed non-viable. County inspectors routinely monitor the sleeved plant material during the 14–21 day period. After the monitoring period, county agricultural inspectors will remove affected leaf samples and submit them to the CDFA Plant Pest Diagnostic Lab for determination of viability. Only after this, can the plants be released for public sale.

"Every indication is that we'll get 100% GWSS-free plants with this program," Hayes reports. "It is going to save a lot of time for the county inspectors at the receiving end, who can go from reviewing every single plant on the host list, to just the treated plants, under the new program."

In 2006, the third shipper, Village Nursery, shifted its Orange County operations to Riverside County and briefly dropped from the trial during relocation. Morris reports that Village Nursery resumed pilot program participation in August.

Results of the program were positive for GWSS control: in 2005, the 54 shipments contained 297 egg masses with no viable emergence of sharpshooters; in 2006 50 shipments of plants had 198 egg masses, again with no viable emergence.

"The California Nursery Code (state law) requires that all plants being shipped be pest- and disease-free," says George Gutman, general manager of Bordier's Nursery, Inc., the participating Ventura County shipping nursery. "No matter what control system is used, we still must stay within the code. But, we've seen the results of the new method and feel that the new system would be better for everyone in reducing the risk of spreading GWSS."

"County agricultural inspectors will always have the option as to how plants arriving from outside their county are handled once they arrive in their jurisdictions, no matter what

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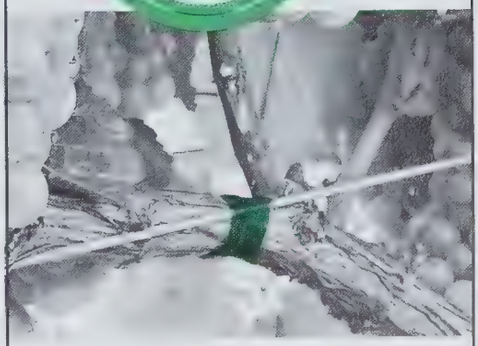

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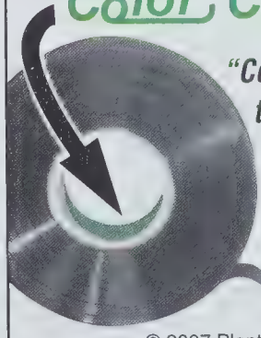

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PD/GWSS Board

Nancy Irelan chosen as first research director

California's Dept. of Food & Agriculture's (CDFA) Pierce's Disease/Glassy-Winged Sharpshooter (PD/GWSS) Board chose Nancy Irelan as the Board's first Research Director, starting in 2006.

Irelan is providing strategic oversight of the Board's research program, including review of the program's efficiency and productivity, developing a strategic plan, managing active projects, and overseeing ongoing search for new research avenues and opportunities.

"Nancy brings valuable experience to the effort with her abilities to build coalitions, understand the complex scientific research and convey the importance of that research to members of the winegrape industry," says Pete Downs, PD/GWSS board chair. "Her scientific background and communication skills are exactly what we need in the battle to control, understand, and combat the potentially devastating Glassy-Winged Sharpshooter pest."

"I look forward to working closely with the CDFA, and our industry and research partners to achieve our program goals of finding a timely and sustainable solution to Pierce's disease," Irelan says.

Before joining the PD/GWSS Board, Irelan spent 12 years with E&J Gallo Winery (Modesto, CA), as vice president of enology and viticulture technology; director of life sciences; research leader for genetics; and senior research scientist for technology.

Irelan is affiliated with 11 industry organizations, including the National Grape and Wine Initiative; Viticulture Consortium, American Viticulture & Enology Research Network; and the Australian Society of Viticulture & Oenology. She has co-published seven scientific research papers related to the wine industry, including: "Efficacy testing of Eutypa chemical and biological control candidates with DNA-based diagnostics," by Nancy Irelan, Doug Gubler, and Richard DeScenzo, January/February 1999, *Practical Winery & Vineyard.*

Irelan is the owner of The Answer Grape, a technical consulting company, a partner of Rogue Vineyards, and president of Red Tail Ridge Winery (Penn Yan, NY). She and Mike Schnell (partner-husband), have planted 12 acres of Riesling and Pinot Noir grapevines on the western shore of Seneca Lake. She is an adjunct professor in the Department of Food Science & Technology at the Cornell University New York Agricultural Experiment Station (Geneva, NY). Irelan earned a doctorate in genetics from the University of California, Davis, and a bachelor of science degree in biology from Glassboro State College. ■

GWSS control method is being used," Wynn agreed.

With only a few shipping and receiving nurseries participating in the pilot program, the CDFA is in need of more participants, and would like to include at least one grapevine rootstock nursery in the mix.

"We want to get more counties to agree to accept plants under the pilot program before we expand it," says Morris. "Only then will people see for themselves how well it works."

Morris cautions that nurseries that will participate in the program need to meet certain guidelines. Interested nurseries should contact their county agricultural commissioner, or Greg Morris of the CDFA to apply for program participation, gmorris@cdfa.ca.gov. ■

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Advantages of *tipping* tanks in New Zealand

BY Henry Work

Necessity, it is said, is the mother of invention. To that, it could be added, without the burden of tradition, people can often see novel approaches to problems. There is a unique solution to the problem of moving grapes, particularly Sauvignon Blanc, from dejuicing tanks to the press in New Zealand.

Ingenuity in New Zealand developed tipping tanks now used in several wineries. Designed to eliminate the back-breaking labor of shoveling must out of tanks after dejuicing or fermentation, these large, stainless steel tanks sit in a frame close to ground level. Wineries use them to accumulate grapes, provide dejuicing and skin contact. With free-run juice drained, the whole tank is tilted to pour the must into a press.

This low-to-the-ground concept evolved as an alternative to satisfy two concerns. One was the time, labor, and sore backs required of standard dejuicing tanks that had to be shoveled out manually. The second issue was extensive structural engineering required to place tanks above a press in an area prone to earthquakes, such as New Zealand.

Placing large, heavy dejuicing tanks high above ground level would require elaborate and costly structural bracing and reinforcement. The answer was to keep tanks low, shape the opening at the top of the tank as a spout which could dump grapes into a funnel, and raise tanks on a hinge only when necessary to feed a press.

Description and use

In New Zealand, tipping tanks have been designed, engineered, and fabricated by Taylors Engineering (Blenheim) Limited, in the Marlborough region.

The tanks are supported in a tubular steel framework, shaped somewhat like a folding camp seat with no legs. Two large hydraulic rams, located on two sides of each tank, tilt the frame-enclosed tank to be dumped. The frame is hinged on the press side, and the tank-top opening is off-center to the same side to facilitate dumping of grapes. The opening is designed like a pour spout, but also can be completely sealed for use as a storage tank.

The size and number of tipping tanks used by wineries varies considerably. Sacred Hill Winery in the Hawkes Bay region, has one 25,000-liter tank that can be tilted over a 150 hectoliter (hl) press. Nautilus Estate, on South Island, has two 25,000-liter tanks dumping into a 150-hl press.

Nobilo Wine Group (near Auckland), has 20 25,000-liter tanks that load into two 240-hl presses, and plans for another 10 tanks with one large press to be built in 2006.

At Montana Brancott Winery (Marlborough region), Nigel Fraser, senior winemaker, explains that the winery's large volume created a need for two banks of tipping tanks; one bank with eight 65,000-liter tanks to load a 320-hl press (see Photo I). Another bank has 10 94,000-liter tanks to load a 430-hl press. Each bank has facing tanks with

Figure I. View of a bank of 94,000-liter tipping tanks at Montana Brancott Winery showing hydraulic rams, used to raise the tanks, and upper tank reinforcement.

an alley way between them in which the press is moved back and forth on a track. A spacious catwalk is positioned over the alley way, at the level of the hinge of the tank frames, about 1.5 meters below the tank tops. Each pair of tanks dumps into a funnel in the middle of this catwalk. The press is positioned under these funnels to receive grapes.

Operation of tipping tanks

To dump a tank, controls are located on the catwalk, where the operator can view the entire operation. Each dump cycle takes about 15 minutes. Slow movement was specifically designed for safety, especially when easing a tank back down, and for efficiency, by using a minimal hydraulic system, which allows only one tank to be raised at a time.

While dumping grapes is a relatively slow process, according to Fraser, it is significantly faster than when they were shoveling grapes out of a tank. They are saving about 30 minutes per press cycle and adding one extra press cycle per day.

Montana Brancott and Nobilo receive mechanically harvested grapes. Delivered to the winery, grapes go into a Vaslin-Bucher or Diemme destemmer/crusher. With the crusher rollers set wide, winemakers feel that these machines provide the minimal force necessary to burst grapes and release free run juice, without producing excessive solids or crushing of seeds. Mono wine pumps, chosen for their minimal impact on the berries, are used to move the must to tipping tanks.

Fraser notes that the must is kept at the ambient temperature of 15° to 20°C. In additional to dejuicing, skin contact, for robustness of flavor from the phenolics, can be easily adjusted in the tipping tanks from one hour up to 12 hours, depending on vintage and vineyard location.

Darryl Woolley (winemaker at Nobilo), varies this regime slightly for Chardonnay and Riesling by draining as they crush to minimize phenolic pick-up. For Sauvignon Blanc, skin contact time is generally about two hours. Insoluble solids in the free run juice are less than 1%.

As a major purpose of the tanks is for dejuicing, numerous screen systems have been devised to maximize juice removal. At Montana Brancott, one screen system has a set of 12 to 18 cone-shaped screens, (the cellar crew call them Madonnas, as in the singer, for some obscure reason). (See photo II.) They are 1.5 meters tall, arranged equally throughout the floor of the tank, and are used to expedite juice extraction by reducing the distance juice travels through the must to a screen. Once in the screened enclosures, the juice then exits the tank.

Can the must clog or pack at the upper opening? Fraser replies that unclogging was a simple matter of lowering the tank and re-tipping. Leaving some juice in the must assists in pouring it out (unloading). To ensure a supply of air in the tank in case of a clog, there is a snorkel installed. "The snorkel allows air in as the must pours out," reports Fraser. "This stops a vacuum from forming and the tank being crumpled inward if the must flow takes up the entire upper opening."

Fraser elaborates on the efficiency and multiple-use of the tanks. While primarily developed for Sauvignon Blanc to provide skin contact and dejuicing, a large amount of Chardonnay and some red wines, primarily Pinot Noir, processed in the winery are also put through them. The tanks are jacketed to handle requirements for various varietals.

The tanks can be used for red wine fermentation; with the wineries employing traditional pump-overs. Tipping tanks can also used to store red and white wines after harvest. Agitators are installed inside the tanks to circulate wine during cold stabilization or some other process requiring agitation after harvest. Agitators are removed during harvest.

Tony Bish, winemaker at Sacred Hill, and Woolley at Nobilo, use the pump-over technique. The tanks can be used for storage after harvest and red fermentation.

Pros and Cons

Anyone who has shoveled must out of a large tank can appreciate the convenience of a tipping tank. At Montana Brancott, the use of tipping tanks has freed up the labor

Continued on page 135

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RUSSIAN RIVER WINE ROAD SURVEY

Do tasting rooms ask guests to pay?

BY Millie Howie

Today, more than 30 years since the exhilarating beginning of the California wine renaissance, many visitors still think of Napa Valley when they say they are going to the wine country. There are a number of reasons for that — a prime one is the decades that wine-marketing genius Robert Mondavi has spent promoting "the Valley."

The ease of getting around Napa Valley is a major factor in its popularity, but until very recently there was one major difference between the two wine centers that drew people to the larger Sonoma County. Most Sonoma County wineries did not charge a fee to taste wine. Now, with high gas prices and financial concerns about rising inflation, visitors to the wine country have fewer dollars available for discretionary spending and many Sonoma County wineries are no longer able to hold the line.

To learn how the picture is changing, *Practical Winery & Vineyard* e-mailed a questionnaire to 121 members of the Russian River Wine Road and asked, "Do you charge for wine tasting? If so, when did you start, and if it is a recent imposition, what caused the change? Do you limit the number of wines that may be tasted? Do you serve food with your wine samples?"

Nearly one-third of the Russian River Wine Road membership responded, and the replies show a reluctant move toward setting a fee schedule for sampling wines, particularly the more rare library and Reserve wines.

For some, like Shirley Buchignani, at the J. Pedroncelli Winery hospitality center (Geyserville), the answer was a quick, "We do not charge a fee, and I don't think Jim and John Pedroncelli would ever charge a fee."

Others, most noticeably J Wines [south of Healdsburg], have always had a fee structure. For Judy Jordan, owner of J Wine, food with wine is part of her philosophy. "Our belief," she states, "is that wine belongs on the table with food. To that end, when we opened our visitor center in 1999, we decided to treat our guests to an experience unparalleled in the wine country. Every day, at the tasting bar, our guests make tasting decisions from a menu of wine and food pairings specially designed by our executive chef, Mark Caldwell.

"The menu highlights a flight of four current release wines carefully matched with foods which are locally grown and often purchased from organic farms. Cost of the flight is $20. A similar pairing experience may be enjoyed on our patio where small lot wines match up with casual, seasonal foods."

Recently, J Wine expanded the visitor's experience by designating the Bubble Room as a Reserve Tasting Salon, with comfortable seating and table service. Wines served in the

J. Pedroncelli Winery tasting room, where guests do not pay for wine tasting.

Bubble Room are older vintages and small production wines that are only available in this tasting area. Reservations for tasting in the Bubble Room are suggested, and J Club members are offered a generous discount on their menu choices.

Virtually all wineries have some food available to go with the wines. Quite often, there are bread sticks or cubes, and many wineries offer artisan cheese tastings along with the wine. Reservations may be required and there may a small cost for this special attention, which also may be held in a separate room, or on a patio or deck. Both DeLoach Winery (west of Santa Rosa) and Hanna Winery (in Alexander Valley) have arrangements with artisan cheese makers to serve interesting gourmet products with the wines.

Most of the wineries throughout the three major Sonoma American Viticultural Appellation areas (Alexander Valley, Dry Creek Valley, and Russian River Valley), fall somewhere in between the never-charge of Pedroncelli and the grandeur of J Wine.

Several are adamantly opposed to setting fees. Among the most emphatic is the staff at Toad Hollow. "We enjoy the response of visitors who are reaching for their wallets as they walk into the hospitality center and express surprise when we say there is no charge," explains Jim Costa. "We like hearing how warm and friendly we are — especially those of us at Toad Hollow."

Scott Lindstrom-Dake and Erica Lindstrom-Dake, owners/winemakers at Thumbprint Cellars (whose tasting lounge is in downtown Healdsburg), do not charge and have no plans to charge. "I can understand why wineries charge for tasting," says hospitality staffer Kenny Lowe, "but when you start charging, it sort of changes things. There are, of course, days when we pour a lot of wine and sales are minimal, but that is all part of marketing."

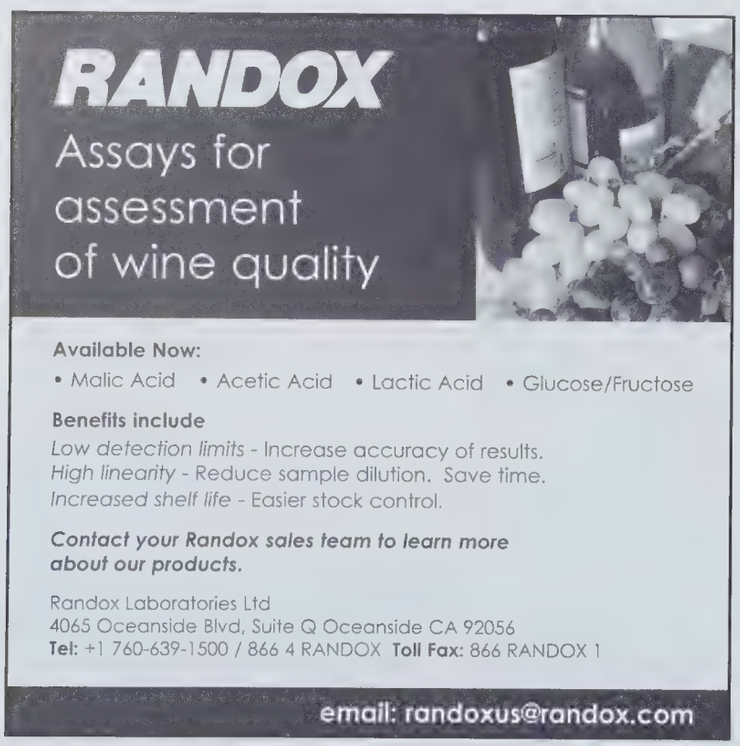
Robert BenEvides, proprietor of Raymond Burr Vineyards (Geyserville), expresses the same view: "We see the pouring of wines for pre-sale tasting as part of the cost of doing business. I think it is unnecessary to charge."

Danny Teldeschi, owner/winemaker of Teldeschi Winery (on Dry Creek Road outside Healdsburg), reports that he doesn't think people want, or expect to pay for sips of wine. "I get half a dozen or more calls a week from people planning trips to the wine country asking if we charge for tasting. I don't charge a fee now and I have no plans to charge in the future." Pat Paulson of Lake Sonoma Winery also falls into the no-charge category, feeling "tasting should be complimentary."

Korbel Champagne Cellars (Guerneville), where 100,000 guests are welcomed each year, with the bulk of visitors arriving in July and August, has always offered free tours and tasting and has no plans to change that policy.

Christine DeLoach, a principal in the family-owned winery Hook and Ladder (on Olivet Road west of Santa Rosa), reports that the tasting room at the winery was opened in February 2006, and she plans to maintain a no-fee approach to wine sampling.

There are 22 wineries which have made an "absolutely no charge" decision. When there is a charge for Reserve, Library, or limited production wines, it tends to be imposed on tasters arriving in a large group — six to eight or more visitors — and is generally about $5 per person. Smaller wineries tend to ask for slightly higher fees, but in either case, the fee is usually applied to a subsequent wine purchase.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email: randoxus@randox.com

Those who are changing or thinking of changing their policy, tend to offer complimentary samples of current release wines and assess a fee for Reserve or limited production wines. The fees are, in general, quite modest and may in most cases be applied toward any wine purchase made during the visit.

Some wineries, such as Huntington Wine Cellars (one of the Front Street Five consortium of wineries beside the Russian River in Healdsburg), are still mulling the option over, but do plan to maintain a limited offering of complimentary wine tastes, whichever direction they may go.

Even those who have already set up a program providing for both pay and no-pay tasting have done so fairly recently — in the last six to 12 months — driven, they say, by the economic picture of the country at large. Logic, they say, compels them to seek a return on samples of upper tier wines and makes it impossible to continue gratuitous pours.

Being presented with a tasting fee does not seem to create a problem for most visitors, particularly when the mix of free to pay wine lists leans so heavily toward free. At Kenwood Winery (Sonoma Valley), for example, there are 18 wines on the complimentary list, and the Reserve wines are available for a low $2 per taste or three tastes for $5.

Projections of future trends vary. Kathleen Southworth, tasting room manager at Rodney Strong Vineyards (south of Healdsburg), reports they are teetering on the brink of setting a fee schedule for all of their wines, but plans are still in the works.

Even with 30,000 visitors a year, Dry Creek Vineyard (Dry Creek Valley), welcomes each guest with a "greeting" wine, and has not seen a drop in visitor count or a negative attitude toward a tasting charge.

Bruce Thomas, tasting room host at Mill Creek Vineyards (on West Dry Creek Road), admits that "we really do not want to charge, but have been considering it. One reason is that to some tourists we have become an entertainment, not an opportunity for wine knowledge expansion. This is particularly a problem as more limousines and vans bring large tour groups to the winery, who tend to take over the tasting room for a social gathering."

Winery tasting rooms will always be the best place for wine enthusiasts to satisfy their curiosity to their advantage. While the prices of wines at the winery are not going to be lower than at one's favorite wine shop or supermarket, there will almost always be several wines that are made in such very small quantities that they are available only at the source.

Small family wineries often have no representation of their wines anywhere other than at the winery, and they also provide the opportunity to talk to the man or woman who actually makes the wine and/or owns the facility.

A wine-tasting foray into Sonoma County, even with the imposition of fees, is still a great value, offering a rewarding diversity of wine varieties and winemaking styles to be investigated.

A growing spirit of togetherness adds to the opportunities for broadening one's knowledge of wine. Sampling may now be enjoyed at a single location, checking out the products of six or eight or ten wineries whose winemaking facilities may be physically located within any of a number of California Appellations, including Napa Valley. One such group is the Family Wineries of Dry Creek Valley (Dry Creek Road), with the wines of six local wineries displayed in the tasting room and three operating wineries at this single location.

Entrepreneurs such as Carolyn Lewis, owner of Locals (Geyserville), invite wine lovers to enjoy complimentary tastings of wine flights set up by grape variety, six days a week. Her stock boasts 65 individual wines from 10 wineries. A few miles down the road in the larger wine town of Healdsburg, 16 wineries with separate tasting rooms in the blocks surrounding the historic Plaza have created a Winery Walk, distributing colorful maps showing the locations and open hours of member wineries, where some sampling is complimentary.

The word you hear most often when speaking to tasting room personnel is "gracious." It seems generally agreed that, as Kenny Lowe of Thumbprint Cellars says, "When you charge a fee it changes things."

It seems that, as far as most winemakers in Sonoma County feel right now, they prefer to be a bit more gracious and to welcome tasters who may become friends and even fans of their wines. Letting them sample those wines free is an act of courtesy Sonoma wineries seem bent on preserving. ■

Winery Planning & Design
By Bruce Zoecklein, Virginia Tech

More than 200 pages of comprehensive work in CD format that covers some basic essentials of planning and designing a winery.
The following topics are reviewed in an easy-to-read outline form:

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PRACTICAL WINERY & VINEYARD

JANUARY/FEBRUARY 2007

SHOWCASE

WINERY EQUIPMENT

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In continuing efforts to meet the material handling needs of North Bay and Wine Country customers, Toyota Material Handling has opened a new facility in Rohnert Park, CA.

For more information, contact:
Toyota Material Handling Northern California
Mark Andres, VP of sales
tel: 510/675-0500
e-mail: mandres@tmhnc.com
website: www.tmhnc.com

PLEASE SEE TOYOTA AD, PAGE 77.

Refrigeration Technology, Inc.

Refrigeration Technology, Inc. (RTI) has built its reputation on well-designed systems that are competitively-priced and easy to maintain. The 100 HP chiller (shown below) has two power supplies and four independent 25 HP compressors providing excellent partial-load efficiency and maximum back-up protection.

New products and designs include central gas-fired and portable, electric glycol heaters. The central gas-fired unit uses an instant heater rated at 95% efficiency. RTI also uses this heater for central hot water systems. The portable heaters require 208v, 230v, or 460v power in single or three-phase versions. They are available in 10KW and 20KW heaters (1KW = 3.5BTU). Rentals are available on a limited basis.

The new web-based software for SUPER STAT will debut at booth #907 at the Unified Wine & Grape Symposium in January 2007. It will allow the user to have two-way communication between the winery and any remote location with Internet access. RTI existing customers will be contacted to upgrade their software.

For more information, contact:
Refrigeration Technology, Inc.
18100 Vintage Court, PO Box 368,
Middletown, CA 95461
tel: 800/834-2232 (toll free) or 707/987-0500
fax: 707/987-4581
e-mail: sales@rti2000.com
website: www.rti2000.com

PLEASE SEE RTI AD, PAGE 98.

ColloPack Solutions, LLC

ColloPack Solutions provides processing and bottling equipment for the wine industry.

Diemme — membrane, screw and basket presses; destemmer/crushers.

Bertolaso — low vacuum, gravity and pressure fillers; corkers; cappers, bottle cleaners; conveyors, and micro-filtration.

Robino & Galandrino — capsule dispensers and applicators.

Cavagnino & Gatti — rotary wet glue, pressure-sensitive labelers.

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Berchi — carton palletizers and depalletizers; case packers and conveyors.

Perrier — sparkling wine disgorging machinery.

Champagel — sparkling wine freezing of yeast solids.

Francisco Oller — sparkling and still wine agglomerated closures.

Tersainox — stainless steel tanks and drains.

Francesca Pump — versatile rotary piston, positive-displacement pump with gentle-flow system; 400 to 15,000 gallons/hour.

ColloPack's staff of trained technicians, and extensive parts inventory ensures superior after-sales service and support.

For more information, contact:
ColloPack Solutions, LLC
193 Camino Dorado, Napa, CA 94558
tel: 707/258-3940; fax: 707/258-3949
e-mail: sales@collopack.com

PLEASE SEE COLLOPACK AD, PAGE 43.

Oenodev USA, Inc.

Fresh thinking about wine maturation.

Patrick DuCournau, owner of Oenodev, invented micro-oxygenation (MOx) in the late 1980s in Southern France. It is employed commercially for controlling tannin development, increasing color stability, combating reduction and vegetative characteristics, and increasing wine longevity.

For 15 years, Oenodev has manufactured and installed worldwide thousands of micro-oxygenation units under the professional guidance of 18 well-trained enologists. Today, Oenodev is the leader with representatives in Europe, the Americas, and Australia.

Oenodev includes, in all its micro-oxygenation equipment, a high-tech ceramic diffuser, which assures an extremely wide range of continuous flow (from 0.25 ml/l/mo to 200 ml/l/mo for tanks from 25 gallons to 150,000 gallons) and stable back pressure. Measurement of O_2 can be expressed in either ml or mg. Through extensive R&D, Oenodev's equipment is constantly evolving to be a fully integrated part of winery operations.

Many MOx users take advantage of full-service support packages, which provide affordable on-site expertise, needed to assure best results and minimize the risk.

Oxygenation is only one aspect of an overall plan for elevage, which is the ongoing focus of Oenodev, who seeks understanding of the structure, age, and color of the wine and its interactions with oxygen, oak, and lees.

Now winemakers can fully control what used to happen by chance, while meeting various objectives without compromising wine quality.

For more information, contact:
Oenodev USA, Inc.
1260 N. Dutton Ave. #240
Santa Rosa, CA 95401
tel: 707/332-1078; fax: 707/542-6364
e-mail: usa@Oenodev.com
website: www.Oenodev.com

PLEASE SEE OENODEV USA AD, PAGE 59.

Western Square Industries

Western Square is the wine industry's largest supplier of portable steel barrel racks, including stainless steel racks in two popular models: the double-inside bar two-barrel and four-barrel racks. Western Square also provides a low-profile inside-bar rack.

Also manufactured is a narrow tractor-row trailer, specifically designed to allow the use of conventional 4-foot wide harvest bins (also made by Western Square) in narrow-spaced vineyards.

Western Square manufactures two devices for holding a single barrel above two-barrel racks. One is a pyramid cradle that replaces four chock blocks, and the other is a removable center cradle.

Western Square produces a barrel-washing system to use with portable barrel racks.

Other products include The Barrel Guard® (see illustration) which prevents barrels from sliding off the racks. The Barrel Guard never needs to be removed. Another safety device is The Barrel Clamp®, which clamps a barrel to the rack and can be installed in five seconds.

Western Square also manufactures an array of products for other industries.

For more information, contact:
Western Square Industries
1621 N. Broadway, Stockton, CA 95205
toll-free tel: 800/367-8383, or
tel: 209/944-0921
fax: 209/944-0934
e-mail: info@westernsquare.com
website: westernsquare.com

PLEASE SEE WESTERN SQUARE AD, PAGE 15.

ARS/Pressure Washer Company

"This little piggy hates to see good wine go down the drain!" ARS/Pressure Washer Company (PWC) introduces the first sanitary pigging system for wineries. Produced by Hygienic Pigging Systems, this little piggy will retrieve 99.7% of the wine remaining in transfer piping with no oxygen contact and no water dilution.

Fermentation heat control just took a step forward with development of the Athena tank temperature controller available from ARS/PWC. Unique to this system is the ability to directly measure temperature of the wine at a specified level in a tank. No thermal well is used.

The Moog barrel washer line has expanded to include three models, all featuring the bunghole-up technique.

New from Fogmaster is an entry-level, highly affordable barrel room humidification system for rooms under 1,000 sq.ft.

It's quiet but the word is out. Miele dishwashers for the tasting room provide crystal-clear glasses that are dry when removed.

When it comes to cleaning and sterilization of tanks, bottling lines and barrels, Hydro Tek pressure washers and SWASH steam generators (built by Electro-Steam) are unsurpassed in quality and performance.

Showroom is open by appointment. Call and they will demonstrate that "We work well under pressure."

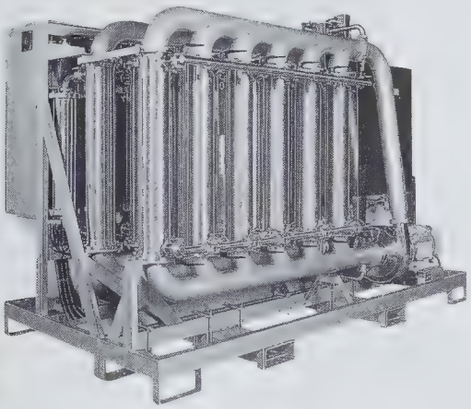
For more information, contact:
ARS/Pressure Washer Company
1184 Maple Lane, Calistoga, CA 94515
tel: 707/942-8330; fax: 707/942-8337
e-mail: info@arsenterprises.com
website: www.cleanwinery.com

PLEASE SEE ARS/PRESSURE WASHER AD, PAGE 16.

Gusmer Enterprises

Gusmer Enterprises, Inc. and Vaslin-Bucher introduce a new line of crossflow filters to the U.S. wine industry. Vaslin-Bucher has engineered a fully automated crossflow system that will clarify wines and prepare them for sterile filtration all in one step.

The new FX series of crossflow filters can accommodate any size winery. The FX1 filter will process 100 to 300 gallons per hour, and the FX400 can process up to 11,000 gallons per hour.



The crossflow design utilizes a low filtration pressure (maximum 1.2 bar) and operates with essentially no increase in wine temperature (5°F maximum). An automatic back-flush system maintains an optimum flow rate, and eliminates disposal issues/handling concerns of other filtration media.

The units are fully automated and can operate around the clock, without direct operator supervision. There is a Vaslin-Busher crossflow filter for every winery budget.

Evaluate a Vaslin-Bucher filter at your facility today with a demonstration unit. A full-time crossflow technical staff is available for demonstrations, training, and service calls. Contact your Gusmer Enterprises representative today for more details.

For more information, contact:
Gusmer Enterprises
Tim Ossun, Shadow Ostowari, Bill Merz, Ken Stewart, Dave Gusmer, Kathy Bollock, Rodger Pachelbel
81 M St., Fresno, CA 93721
tel: 559/485-2692; 559/485-4254
e-mail: sales@gusmerenterprises.com
website: www.gusmerenterprises.com

PLEASE SEE GUSMER ENTERPRISES AD, PAGE 70.

Valley Pipe & Supply, Inc.

Valley Pipe & Supply, Inc., currently in its 67th year in business, has headquarters in Fresno, CA, and sales offices in Napa, CA, and Sonora, Mexico. Valley Pipe & Supply began in 1940 as a supplier to many food processing, chemical, industrial, and OEM manufacturing plants in the surrounding San Joaquin Valley.

Importing and manufacturing of equipment for the wine and beverage industries throught the U.S., Mexico, and Canada began in the late 1980s.

To provide more service to its customers, Valley Pipe & Supply has a full-time technician trained at several of the overseas factories whose machinery Valley Pipe & Supply represents.

Valley Pipe & Supply, Inc. represents the following brands:

- Defranceschi membrane presses, automatic punchdown tanks, the "Puntarossa" automatic punchdown and pumpover combination tank;
- Amos and Milani destemmers;
- Spadoni filters;
- Enopompe piston pumps;
- BCM flexible impeller pumps;
- Acrolon Technology TankNet controls;
- and other winery pumps and supplies.

Banding of Valley Pipe & Supply "Cuvee" rubber hose and several styles of PVC hose and fabrication of stainless hoppers, dumps, conveyors, three-way must valves, Valley Pipe & Supply pumps, and PCT fittings is done at the Fresno, CA location.

Valley Pipe & Supply would like to thank the wine industry for their patronage and support and looks forward to being of future service.

For more information, contact:
Valley Pipe & Supply, Inc.
1801 Santa Clara, Fresno, CA 93721
tel: 559/233-0321; fax: 559/233-1713

PLEASE SEE VALLEY PIPE & SUPPLY AD, PAGE 41.

Pro Refrigeration Inc.

Pro Refrigeration is a leading manufacturer and supplier of refrigeration equipment to the winery and brewing industries.

Pro's ever-growing Proformer™ refrigeration equipment product line includes much more than the world-class Pro Chiller System; they have amassed a line of equipment to handle the refrigeration needs of all size wineries.

The Proformer™ product line includes: Plate and Tubular Heat Exchangers for juice cooling, Storage Room Cooling Coils and Controllers, Storage Tank Temperature Controllers, Multiple Tank Temperature Control Centers, and much more.

Pro offers the CR110 Refrigeration Controller in their complete product line. This control provides increased refrigeration system control and improved efficiency, complete system operating data and control at your fingertips using the G55 Interface with LCD screen, and remote monitoring and control capabilities.

In addition to cooling systems, Pro offers glycol heating systems that utilize the reclaimed heat from the refrigerant to heat the glycol solution.

Please visit the newly updated website, www.prochiller.com, which includes industry-related articles and a new webstore for all after-market needs.

Over the past 16 years, Pro has worked with some of the finest winemakers to develop a product line specifically for the winemaking craft.

"When Keeping Cool is Everything"™

For more information, contact:
Pro Refrigeration Inc.
Jim VanderGiessen Jr.
326 8th St. SW, Auburn, WA
tel: 253/735-9466; toll-free: 800/845-7781
fax: 253/735-2631
e-mail: info@prorefrigeration.com
website: www.prochiller.com

PLEASE SEE PRO REFRIGERATION AD, PAGE 73.

Koch Membrane Systems

Koch Membrane Systems, Inc. (KMS) is introducing hollow fiber crossflow microfiltration (CMF) systems designed specifically for use in wine clarification. The systems employ a new membrane that is sturdier and more productive than other membranes.

With KMS crossflow filtration, a feed stream flows parallel to the membrane surface at high velocity as compared to the perpendicular flow path employed in conventional depth filtration. By keeping suspended material from settling, crossflow filtration minimizes the build-up of solids on the membrane, delivering a high permeation rate and maintaining stable throughput. CMF can be employed as a one-step process, eliminating the need for multiple diatomaceous earth filtration steps.

KMS systems are flexible, efficient, and gentle on wine due to minimal oxygen pickup and heating. They are available as manual machines, partial, and fully automated systems requiring little or no operator attention.

For more information, contact:
Koch Membrane Systems
850 Main St., Wilmington, MA 01887
tel: 888/677-5624
e-mail: info@kochmembrane.com
website: www.kochmembrane.com

PLEASE SEE KOCH MEMBRANE SYSTEMS AD, PAGE 139.

Stokes Ladders, Inc.

A leading manufacturer of aluminum orchard ladders for more than 40 years, Stokes Ladders, Inc. offers quality rolling barrel-room ladders specifically designed to fit in narrow aisles between stacks of wine barrels. Now used in over 60 West Coast wineries, these ladders provide workers safe access to barrels without having to climb racks, and eliminate having to lower barrels with a forklift to be inspected or topped.

Ladders allow access to stacks up to six barrels high. The height of the ladder, combined with a narrow 18-inch width, allow for maximum barrel count in a barrel room.

The ladders are constructed of high-strength, light-weight structural aluminum, and feature four heavy-duty, non-marking locking casters, a roomy 16-inch x 24-inch top platform with handrails and toe boards, 7-inch deep steps, and a comfortable 60-degree climbing angle.

Options include a back ladder and different base configurations. Because of the narrow base, these ladders must only be used in the narrow confines of barrel aisles. Custom ladders are available.

For more information, contact:
Stokes Ladders, Inc.
PO Box 445, Kelseyville, CA 95451
tel: 707/279-4306 or 800/842-7775
fax: 707/279-2232
e-mail: info@stokesladders.com
website: www.stokesladders.com

PLEASE SEE STOKES LADDERS AD, PAGE 36.

St. Patrick's of Texas

St. Patrick's supplies equipment for small to mid-size wineries from three warehouses covering 30,000 sf in Austin, TX. Product descriptions and pricing are available online at www.stpats.com. Equipment manuals are also available online.

St. Patrick's of Texas

St. Patrick's of Texas stocks the following equipment:

- Electric corkers with vacuum/gas;
- Pneumatic corkers;
- Monoblocks (filling and corking);
- Semi-automatic labelers;
- Enoitalia crusher/destemmers;
- Wine tanks;
- Hydraulic, water, and ratchet presses;
- Barrel tools;
- Pumps;
- Stainless steel valves and fittings;
- Wine hose and clamps;
- Refractometers, ebulliometers;
- Heat shrink and foil applicators;
- Norcor corks;
- Rotary vacuum, lees, plate, and cartridge filters;
- Filter sheets, membrane filters;
- Filling machines.

For more information, contact:
St. Patrick's of Texas
1828 Fleischer Dr., Austin, TX 78728
tel: 512/989-9727; fax: 512/989-8982
e-mail: stpats@bga.com
website: www.stpats.com

PLEASE SEE ST. PATRICK'S OF TEXAS, PAGE 18.

Cryotech International, Inc.

Cryotech International, formerly VBS, a leader in liquid nitrogen delivery systems for container pressurization and/or oxygen displacement, can help wineries reduce headspace oxygen and extend shelf life in screw cap packages while maintaining taste.

As the wine industry transitions to screw caps, winemakers are presented with new, unique challenges. Although screw caps eliminate the concern of "cork-taint," screw cap bottles have a greater volume of headspace. Wine is exposed to oxygen trapped in bottle headspace, which can result in increased dissolved oxygen levels, even after the cap is applied. Cryotech can help.

By introducing liquid nitrogen into the bottle after filling, winemakers reduce headspace O_2 content by more than 70%. Less headspace O_2 results in a significant reduction of dissolved O_2 pickup.

Cryotech has a complete line of liquid nitrogen-dosing equipment to automate and control the introduction of LN_2. A very small dose of LN_2 is injected into the filled bottle. One part of liquid nitrogen warms and turns into 700 parts of gas, displacing O_2 from the headspace.

After installing a Cryotech injection system, one customer reports dissolved oxygen content of less than 0.03 ppm without compromising the fresh fruit taste of the wine.

For more information, contact:
Cryotech International, Inc.
745-B Camden Ave., Campbell, CA 95008
tel: 408/371-3303; fax: 408/866-8371
e-mail: sandrade@vbsflex.com
website: www.cryotechinternational.com

PLEASE SEE CRYOTECH AD, PAGE 7.

Winesecrets

Winesecrets' STARS (Selective Tartrate Removal System) has processed more than 2 million gallons of wine in North America since its debut in 2003. STARS uses electrodialysis to remove tartrates and their cations, potassium, and calcium from wine through selectively permeable membranes.

Winesecrets

With the support of the California Energy Commission, Winesecrets has confirmed that STARS saves energy—lots of it. STARS eliminates the need for refrigeration and reheating during tartrate removal, resulting in electricity savings of more than 95% when compared to the conventional method of tartrate stabilization. The process can reduce electricity costs by 20% to 30%.

Winesecrets offers mobile units, which provide stable wine at a rate of 600 and 1,600 gallons per hour. Stationary units, available for lease or sale, provide stable wine at 400, 800, 1,200, 1,600 or 3,000 gallons per hour.

STARS benefits include:

- Wine available for bottling immediately;
- Gentle single-pass process;
- No loss of wine flavor, aroma or volume;
- Reliable stability;
- pH adjustment;
- Energy and cost reduction;
- Your winery, your schedule.

SAVE YOUR ENERGY

Winesecrets is currently working with PG&E to develop aggressive utility incentive programs for the wine industry. The future of environmentally-responsible wine production is here, and it tastes great!

For more information, contact:
Winesecrets
101 S. Coombs St., Suite F, Napa, CA 94559
tel: 707/255-9107; fax: 707/255-9167
website: www.winesecrets.com

Santa Rosa Stainless Steel

Santa Rosa Stainless Steel (SRSS), one of the world's largest wine tank manufacturers, is in its 39th year of production.

SRSS builds tanks with capacities from one-gallon up to 700,000-gallon field-erected tanks. Each tank is finely crafted and passes through a rigid series of quality control checkpoints before shipment. Tanks are available on short notice from stock or may be custom-built to winery specifications.

Cooling jackets or panels can easily be added to existing tanks. SRSS press dimple jackets are quick to install in the field for retrofits to existing non-jacketed tanks for increased efficiency.

Jobsite retrofitting and tank repair are a large part of SRSS expertise. In 2001, SRSS released a state-of-the-art, automatic punch-down unit that is installed in the tank and operated by an air cylinder above the tank. The automatic control system is manufactured by Green Controls of Cloverdale, CA. Five units were installed and operating at Carneros Creek Winery for the 2001 crush.

SRSS can design and build tanks for micro-oxygenation. SRSS can also convert existing tanks for micro-oxygenation.

For more information, contact:
Santa Rosa Stainless Steel
1400 Airport Blvd., Santa Rosa, CA 95403
tel: 707/544-7777; fax: 707/544-6316
e-mail: rod@srss.com
website: www.srss.com

PLEASE SEE SRSS AD, PAGE 3.

AaquaTools, Inc.

AaquaTools, Inc. (formerly Industrial Cleaning Systems) has provided water-driven cleaning tools to the wine industry for more than 20 years. AauquaTool's success is a result of an ability to fill sanitation voids with high pressure, low-flow, specialty cleaning tools that clean quickly with minimal amounts of water.

AaquaTools, Inc.

AaquaTools' AaquaBlaster series of self-propelled cleaning tools can be used for either barrel or tank washing. Robust and reliable, the AaquaBlaster successfully cleans with hot water (up to 185°F) and high impingement, with minimal amounts of wash fluid.

AaquaTools HotCart portable propane-fired hot water generator/high pressure washer, provides hot water (up to 180°F) for domestic or high-pressure applications. Fired by clean-burning, energy-efficient, "tankless technology" and, coupled with a KEW Poseidon pump and motor assembly, AaquaTools Hot Cart's make dirty, odorous, diesel-fired pressure washers a thing of the past.

The KEW Poseidon is a perfect driver for all water-driven tools. Designed as a cold water electric pressure washer, the Poseidon receives hot water up to 185°F while delivering up to 2,750 psi @ 5.5 gpm.

AaquaTools offers ozone and steam generators, water-driven floor cleaning attachments, and many more effective cleaning tools.

For more information, contact:
AaquaTools, Inc.
PO Box 3119, Diamond Springs, CA 95619
toll free: 800/777-2922; fax: 916/635-8856
e-mail: info@AaquaTools.com
website: www.AaquaTools.com

PLEASE SEE AAQUATOOLS AD, PAGE 64.

Vinovation, Inc.

Vinovation's second generation has arrived. Vinovation started as the industry's first developer of advanced technologies, techniques, and processes for making wine better, cheaper, and easier. With 15 years of dedicated R&D and process development, Vinovation's cutting edge is now mainstream, with the most reliable and experienced services and equipment in the industry.

Vinovation offers multiple services that integrate seamlessly into the client's winemaking. This includes MemstarAA, the only mobile alcohol adjustment system to operate in a client's own cellar.

Vinovation, Inc.
New tools for an ancient craft...
www.vinovation.com

Mobile services setup quickly and easily on-site to do alcohol adjustment, VA reduction, 4 EP/4 EG removal, and ultra-filtration for recovery of press fractions and phenolic concentration. The highest priority of Vinovation's experienced operators is protection and optimization of the client's wine.

At its facility, Vinovation offers these same services and more in a newly renovated environment with the best quality control in the industry. In addition, Vinovation's updated facilities now offer state-of-the-art custom crush, bottling, winemaking, and storage.

Vinovation is also a sales and service provider for reverse osmosis, alcohol adjustment, GE membranes, Cat pumps, and more OEM equipment. They also offer sales of high-proof alcohol, and flat bed transportation.

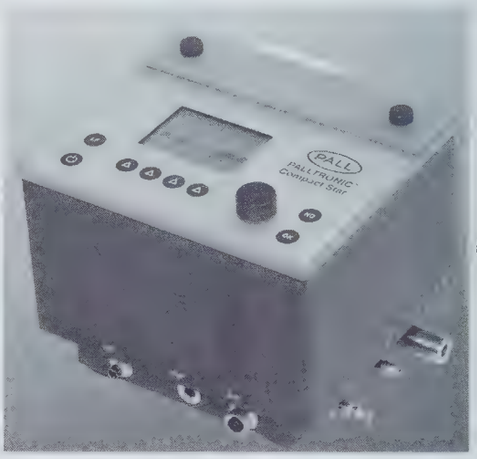
For more information, contact:
Vinovation, Inc.
1446 Industrial Ave., Sebastopol, CA 95472
tel: 707/824-7900; fax: 707/824-7905
website: www.vinovation.com

PLEASE SEE VINOVATION AD, PAGE 25.

Pall Corporation

The integrity of a final filter is critical for the control of microbial contamination in wine. The Palltronic® Compact Star integrity test device provides an accurate confirmation of the filter's integrity in situ. It performs a complete and reliable pressure-hold test to determine the integrity of a filter by measuring pressure decay over a period of time.

Compact Star test unit holds true to its name — it is small, lightweight, and portable. Yet, it can even be used to perform integrity testing on very large installations.



Although inexpensive, this test device offers a full range of convenient features and is completely automated, eliminating the variability of results that can occur with manual tests.

Test results are displayed in a large window at the top of the unit, automatically saved in memory, and printable for use in process documentation. Test programs can either be created or retrieved from memory. Up to 250 test programs and 1,000 test results can be stored or downloaded to a PC. In addition, language and units of measure can be selected for each test.

For more information, contact:
Pall Corporation
Nicole Madrid, General Sales Manager
25 Harbor Park Dr.
Port Washington, NY 11050
tel: 516/801-9137
e-mail: foodandbeverage@pall.com
website: www.pall.com

PLEASE SEE PALL CORPORATION AD, PAGE 67.

Euro-Machines, Inc.

Scharfenberger, from Germany, presents its new, redesigned Europress series. The new series includes nine sizes (6 to 60 hl), and is available as an open or closed system. Starting at 20 hl, the press can be equipped with a hermetically-sealed door. Another option is a variable frequency-drive motor.

Europress is manufactured completely by Scharfenberger — including the electronic controls. Modern machinery operated by professional staff, combined with solid, handcrafted production, gives customers the highest-grade equipment, both technically and qualitatively.

For over 30 years, the experts in the Scharfenberger electronics department have worked exclusively on development, programming, and production of the Europress' electronic controls. This enables the company, beyond offering a state-of the-art product and quick spare parts provision, to guarantee competent service in every respect.

Over 70% of all Europress grape presses are manufactured as custom-tailored. The Scharfenberger design department welcomes every new challenge, and offers maximum flexibility and adaptability to the individual requirements of customers anywhere.

Euro-Machines, the U.S. division of Scharfenberger, is committed to excellent customer service. Warehouses and service vehicles are fully stocked with spare parts so that Euro-Machines' knowledgeable and well-trained technicians may provide timely service to customers.

For more information, contact:
Euro-Machines, Inc.
4950 Fulton Dr. Ste. E, Cordelia, CA 94534
tel: 707/864-5800; fax: 707/864-5879
e-mail: mattateuro@aol.com
website: www.euromachinesusa.com

PLEASE SEE EURO-MACHINES ADS, PAGE 34, 61.

Fogmaster Corporation

Fogmaster's new Sentinel-5850 barrel-room humidification system brings innovative atomization technology to small- and mid-size wineries. It uses a turbulent-vortex nozzle to atomize water into micro-droplets that evaporate quickly and spread uniformly throughout the barrel room.

The control unit (pictured) monitors relative humidity and regulates water flow. A regenerative blower, designed for efficiency and low-maintenance cost, provides air to atomize water.

When humidity drops below the set point, the control unit activates the system and the nozzle ejects a fog of tiny droplets. The droplets evaporate quickly and raise humidity so barrels stay dry. Because the nozzle has no tiny orifices, nozzle plugging is not an issue.

Designed for "do-it-yourself" installation, the Sentinel-5850 includes all installation components except the two-inch PVC pipe needed to convey air from the blower to the nozzle.

A single nozzle system can maintain a 5,000-sq.ft. barrel room. A cart option is available for users requiring mobility.

For more information, contact:
Fogmaster Corporation
1051 SW 30th Ave.
Deerfield Beach, FL 33442
tel: 954/481-9975; fax: 954/480-8563
e-mail: info@fogmaster.com

PLEASE SEE FOGMASTER AD, PAGE 92.

Redwood Refrigeration

The founders of Redwood Refrigeration have over 30 years of experience in the refrigeration industry, spanning design, service, and installation in both industrial and commercial settings. The company specializes in winery refrigeration and cooling services, process cooling, and cold storage applications. Redwood Refrigeration provides consulting engineering and installation service.

Redwood Refrigeration

The service division focuses mainly on troubleshooting, preventive and predictive maintenance, and ensuring reliability. By providing factory and in-house trained staff with fully-equipped service vehicles, Redwood Refrigeration can meet all of your refrigeration and cooling needs.

Redwood is a member of industry associations including American Society of Heating, Refrigeration and Air Conditioning (ASHRAE), Refrigerating Engineers and Technicians Association (RETA), and Refrigeration Service Engineers Society (RSES).

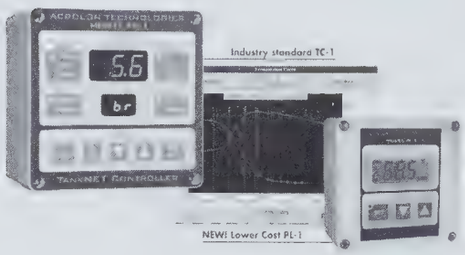
For more information, contact:
Redwood Refrigeration
1160 Industrial Ave, Suite F
Petaluma, CA 94952
tel: 707/766-8950; fax: 707/776-0955
e-mail: dan@redwoodrefrigeration.com
website: www.redwoodrefrigeration.com

PLEASE SEE REDWOOD REFRIGERATION AD, PAGE 8.

Acrolon Technologies, Inc.

Acrolon is a leading supplier of web-based cellar automation solutions.

Its TankNET® system, introduced in harvest 2000, was a first of its kind. Since then, TankNET® has become a standard for web-based temperature control and fermentation management.



In 2005, Acrolon introduced another industry first — **Power Line networking.** Available on the new PL-1 thermostat, Power Line networking allows TankNET® thermostats to communicate with a TankNET® web-server appliance over existing electrical wires in the cellar. Power Line networking dramatically lowers installation costs by eliminating tank-to-tank network cabling.

TankNET® features include:

- Anytime/Anywhere accessibility via web-browser;
- Multi-user/Multi-level access control;
- Automated heating and cooling;
- Brix, temperature, and pump-over tracking by lot code;
- Custom, animated cellar maps and reports;
- Real-time data logging, trending, and archiving;
- Instantaneous alarms via cell phones or email.

Expansion options available with the TC-1 include:

- Scheduled pump-overs and Brix monitoring;
- Humidity and CO_2 management;
- Stuck valve and level detection;
- Strati-probe™ deep, multi-point temperature monitoring.

For more information, contact:
Acrolon Technologies, Inc.
19229 Sonoma Hwy, Sonoma, CA 95476
tel: 707/938-1300; fax: 707/938-1342
e-mail: ben@acrolon.com
website: www.acrolon.com

PLEASE SEE ACROLON TECHNOLOGIES AD, PAGE 8.

Skolnik Industries, Inc.

Skolnik stainless steel cooperage is designed to meet the special needs of winemakers in all stages of fermentation, maturation, and storage of fine wines. Skolnik has a long and proud tradition of providing leading winemakers with stainless steel drums of high quality, durability, and design.

Skolnik's wine industry customers look to stainless steel cooperage to supplement oak barrels in key stages of the winemaking process. Stainless steel offers unique and unsurpassed qualities for preserving product integrity and purity — important considerations for why stainless is a key tool for winemakers.

Stainless steel cooperage is:

- Versatile and adaptable to many uses;
- Ready for use after being sterilized;
- Cost-effective and long-lasting;
- Predictable, reusable, and easy-to-clean;
- Virtually maintenance-free;
- Available in sizes from 5 to 55 gallons.

SKOLNIK INDUSTRIES, INC.
MANUFACTURERS OF STAINLESS STEEL BARRELS

Skolnik is a full-service manufacturer of steel containers and accessories. Every Skolnik container is thicker, heavier, and stronger than industry standards — a commitment made to customers for more than 75 years.

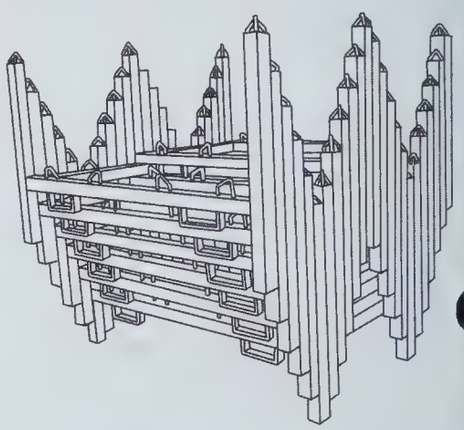
For more information, contact:
Skolnik Industries, Inc.
Jason Snow
4900 S Kilbourn Ave., Chicago, IL 60632
tel: 773/362-1913; fax: 773/735-7257
e-mail: jason@skolnik.com
website: www.skolnik.com

PLEASE SEE SKOLNIK AD, PAGE 52.

Barrel Master

The "Barrel Master," manufactured by Western Square Industries, is a self-supporting barrel rack, first introduced in Australia, and now available in the U.S.

The "Barrel Master," a convenient, safe, and labor-saving barrel racking system, is a unique design that is substantially more "stack stable" than competitors. Stacks up to eight-high with modules to suit all barrel styles. Powder-coating ensures a rust-free finish that will last a lifetime. "Barrel Master" racks are made in the U.S.



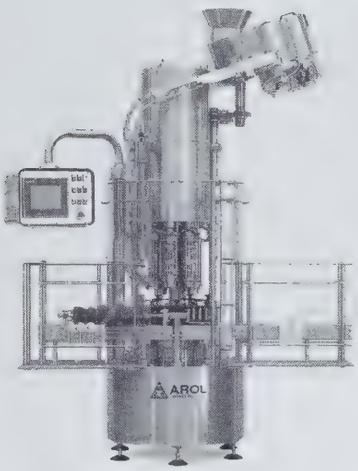
Special features include:

- No weight on barrel.
- No need to have same size barrels at each level.
- Allows for just one barrel at any level.
- Bigger footprint on floor for greater stack stability.
- Forklift entry from both ends with anti-tipping bars.
- Round, smooth saddles that won't "dig in" when turning or positioning barrels.
- Excellent access for "top up" and "sampling."
- Rack specifications: 63.32 inches long x 34.4 inches deep x 37.4 inches tall. 2½-inch steel tubing.

For more information, contact:
Western Square Industries
1621 N. Broadway, Stockton, CA 95205
toll-free tel: 800/367-8383
tel: 209/944-0921; fax: 209/944-0934
e-mail: info@westernsquare.com
website: westernsquare.com

AROL USA

A major bottling innovation, the AROL EURO/VAC capper is the state-of-the-art in aluminum ROPP closures, including the 30mm x 60mm long-skirted wine cap. The new EURO/VAC uses a patented process that draws a vacuum on the headspace of the bottle prior to rolling the threads, thereby providing a vacuum atmosphere under a conventional aluminum ROPP cap. A worldwide breakthrough that offers a reliable solution for decreasing the problems of the oxidation of wine in glass bottles.



The ROPP cap is picked-off by the bottleneck as the bottle moves into the capping carousel and is lifted by pistons until the bottle enters the vacuum bell. Then, a vacuum pump is activated, which creates a vacuum inside the bottleneck. At this point, the AISI 304 stainless steel SSC head threads the ROPP cap.

Besides the patented vacuum-in-the-headspace innovation, this machine is designed with a unique and creative round structure. Not only is its round frame aesthetically appealing, its shape provides complete accessibility for maintenance and changeover.

For more information, contact:
AROL USA
Division of Angelus Sanitary Can Machine Co.
450 Satellite Blvd. NE Ste. D
Suwanee, GA 30024
tel: 678/318-1290; fax: 678/318-1296
e-mail: salesusa@arol.com
website: www.arol.com

PLEASE SEE AROL USA AD, PAGE 14.

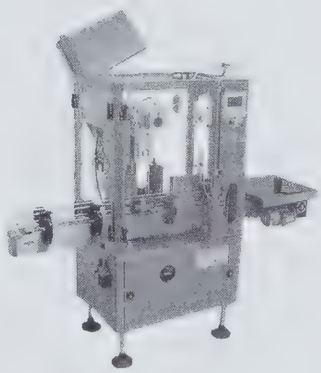
Criveller Company

Criveller Company has supplied the wine and beverage industries for over 25 years!

Criveller's Windsor, CA, office is able to expedite customer service for wineries in California, Oregon, and surrounding western states.

Criveller carries a wide variety of processing equipment for every wine-making phase and fabricates stainless steel tanks to customer specifications. Red wine fermentors with a mobile plunger are available.

In conjunction with leading manufacturers of bottling and labeling equipment, Criveller offers manual, semi-automatic, or fully automatic bottling lines, including cost-effective monoblocs and triblocs that cater to all bottling needs.



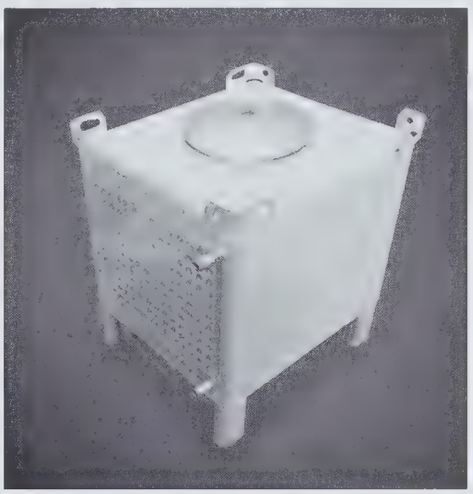
Criveller's warehouses in Niagara Falls, Canada, and Windsor, CA, stock various models of bottling equipment, filters, destemmer/crushers, presses, and stainless steel tanks, including variable capacity and mini-tanks, for customer inspection.

For more information, contact:
Criveller Company
West Coast: Criveller California Corp.
Bruno Criveller or **Kimberly Rickman**
10350 Old Redwood Hwy.
Windsor, CA 95472
tel: 707/838-2222; fax: 707/838-2242
e-mail: crivca@sonic.net
Canada
Bruno or **Mario Criveller**
6935 Oakwood Dr.
Niagara Falls, Ontario L2E 6S5
tel: 905/357-2930; fax: 905/374-2930
e-mail: info@criveller.com
East Coast
PMB 202, 1623 Military Rd.
Niagara Falls, NY 14304-1745
tel: 905/358-5202

PLEASE SEE CRIVELLER COMPANY AD, PAGE 84.

Hoover Materials Handling Group

Hoover Materials Handling Group, Inc. has the answer for your wine storage during peak production times. Stainless steel Wine Totes™ are manufactured in an ISO 9001:9002 facility to meet the high-quality standards of the wine industry. Tanks are ideal for fermenting Sauvignon Blanc and other white wines, or for temporary storage of red wines.



Hoover has been manufacturing containers since 1949, and has withstood the test of time.

Tank sizes available are 180, 250, 350, 450, or 550 gallons.

The wine tank features:

- 304 stainless steel (10-gauge) construction,
- 22.5-inch top opening,
- 2-inch sanitary 90° elbow in tank bottom for discharge.

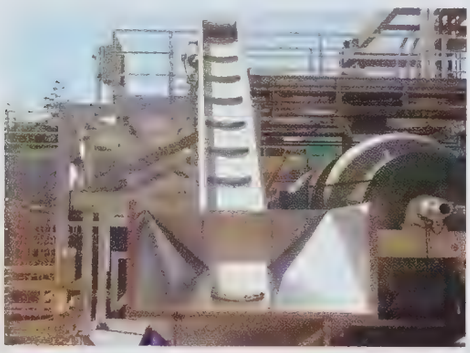
Numerous options are available, including a 304 stainless steel (14-gauge) heating and cooling transfer surface.

For more information, contact:
Hoover Materials Handling Group
8801 Wallisville Rd, Ste. A
Houston, TX 77029
tel: 800/844-8683; fax: 713/678-7077
website: www.HooverSolutions.com

PLEASE SEE HOOVER MATERIALS HANDLING AD, PAGE 65.

Ogletree's, Inc.

For 60 years, Ogletree's has specialized in custom fabrication of winemaking equipment. By relying on the continual pursuit of innovation and the company's historical stability, Ogletree's is able to optimize value and quality to satisfy the wine industry's needs, while providing customers with the security that the job will be done right the first time.



Ogletree's manufactures high-quality hoists, receiving hoppers, belt and screw conveyors, sorting systems, transfer lines, catwalk systems, and more. Ogletree's provides maintenance on all equipment offered.

Ogletree's years of service to the wine industry serve as a foundation for its design team who design a superior product by collecting input from clients and focusing on specific needs. By utilizing solid quality-control procedures and a precise six-point inspection, Ogletree's team of experienced fabricators deliver products second to none.

Since 1946, Ogletree's has been a valuable asset to the wine industry, offering innovative solutions to help winemakers distinguish their products in a competitive marketplace. The company's commitment has never changed. Ogletree's provides customers with high-quality fabrication with excellent value and on-time delivery.

For more information, contact:
Ogletree's, Inc.
935 Vintage Ave., St. Helena, CA 94574
tel: 707/963-3537; fax: 707/963-8217
e-mail: speers@ogletreecorp.com

PLEASE SEE OGLETREE'S AD, PAGE 63.

Sanitary Stainless Welding, Inc.

Sanitary Stainless Welding, Inc. manufactures custom-fabricated storage and fermentation tanks for the wine industry. Tank sizes offered range from 250 gallons up to 700,000 gallons.

Options include, but are not limited to:

- dimple jackets;
- channeled jackets;
- manways of various sizes;
- sample and racking ports;
- a variety of fittings and valves.

Tanks are offered with sloped or conical bottoms and sit on either metal or concrete bases. Tank Tops include off-center, truncated or centered, conical tops.

Sanitary Stainless Welding, Inc. offers custom-design catwalks in either stainless steel or aluminum. The company also offers "tube in tube" heat exchangers, grape receiving hoppers, screw conveyors, tubing line installation, crusher repairs, press repairs, tank modification, and tank repairs.

Sanitary Stainless Welding, Inc. was founded in the original Valley Foundry facility in 2004, to be a premier tank construction solution.

For more information, contact:
Sanitary Stainless Welding, Inc.
2550 S. East Ave., Suite 101-B
Fresno, CA, 93706
tel: 559/233-7116; fax: 559/233-7172
e-mail: jimm@sanitarystainless.com

PLEASE SEE SANITARY STAINLESS AD, PAGE 44.

Bulldog Manufacturing

The Bulldog Pup is the original gas-pressure racking wand. Since its introduction in 1986, the Pup has earned a reputation for its durable design constructed by craftsmen using quality materials. The sanitary design is easy to clean and will hold up to many years of cellar use.

Transferring wine with gas-pressure allows easily-controlled gentle flow without agitation or oxidation. Lees are monitored through a Pyrex sight-glass using the Pup's nine inches of vertical height adjustment. The wand is then locked in place at desired height to achieve extremely clean rackings. An expanding silicone bung snuggly seals the wand in the barrel preventing gas leakage.

Optional attachments are available to add to the versatility of the Pup:

- The **Foot Valve** is a check ball valve for the wine inlet to prevent wine from siphoning out when removing the wand from a barrel.
- The **Flex Leg** allows insertion into barrels with limited access.
- The new **Top Dog** secures the Pup in beer kegs for topping or racking.

"Don't settle for a mutt!"

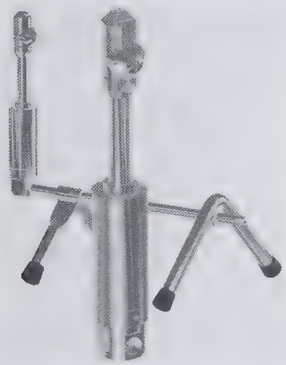
For more information, contact:
Bulldog Manufacturing
PO Box 356, San Luis Obispo, CA 93406
tel: 805/541-3083; fax: 805/544-6181
e-mail: pups@bulldogmfg.com
website: www.bulldogmfg.com

PLEASE SEE BULLDOG MANUFACTURING AD, PAGE 106.

Gamajet Cleaning Systems

For 50 years, Gamajet has listened to customers and developed a wide range of cleaning machines that advance the technology of cleaning winery tanks and barrels.

Responding to the need for effective tank cleaning, Gamajet developed the fluid-driven Gamajet 4, Gamajet 8, and Gamajet 9 machines, which provide powerful wash streams at low pressure. Tanks as tall as 50-feet can be easily cleaned, either from the top or from the bottom.



For better barrel cleaning, Gamajet has developed the HD Barrel Blaster, which features heavy-duty construction and a large geartrain that remains outside the barrel. It is the strongest, most durable barrel cleaner ever made, lasting three times longer than previous machines.

For in-place barrel cleaning, Gamajet offers the All-In-One, which combines impingement cleaning with vacuum extraction. Clean and empty racked barrels in a single operation. The Evacu-Blast system includes a high-pressure pump, an All-In-One, and a vacuum pump — everything needed to clean and empty barrels in-place. The Evacu-Blast HW mounts a hot-water-pressure washer supplying heated cleaning solutions.

All Gamajet winery cleaning machines and systems are included in Gamajet's new video presentation. Free copies are available upon request in either CD or DVD formats.

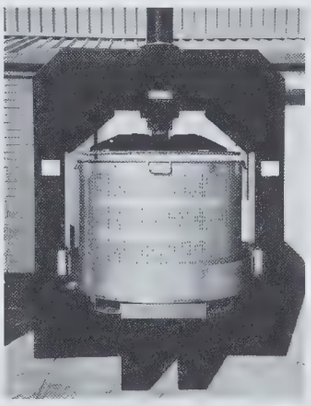
For more information, contact:
Gamajet Cleaning Systems
PO Box 626, Devault, PA 19432
tel: 877/426-2538; fax: 610/408-9945
e-mail: sales@gamajet.com
website: www.gamajet.com

PLEASE SEE GAMAJET AD, PAGE 28.

HYPAC

In 1980, S. Smith and Son, Yalumba Wines (Barossa Valley), bought two HYPAC electro-hydraulic variable-speed pump drives to feed their entire winery. These drives have completed 26 harvests, with only routine filter and oil changes.

HYPAC developed a programmable traditional electro-hydraulic basket press in 1999, combining centuries-old technology with modern materials and techniques. The traditional style has given way to more modern and hygienic fork-lift-loaded stainless steel pans and baskets, with five different capacities.



Press frame and components are engineered to reliably withstand pressure during operation. Maintenance is negligible — daily wash-down, with first oil change recommended after four years. With increments of one over a range of 250-bar hydraulic pressure, the HYPAC basket press is ideal for any red or white grape variety and wine style.

A more compact and flexible basket press design should be trialed and completed during the southern hemisphere 2007 harvest. This new design will be available for the 2007 harvest in the U.S. HYPAC manufactures baskets and pans in California for the U.S. market, and press frames will be built in the U.S., as U.S. sales increase. HYPAC is represented in the U.S. by TCW for all sales inquiries.

For more information, contact:
TCW (The Compleat Winemaker)
955 Vintage Ave., St. Helena, CA 95474
tel: 707/963-9681; fax: 707/963-7739
e-mail: info@hypac.com.au
website: www.hypac.com.au

PLEASE SEE HYPAC AD, PAGE 37.

Westec Tank & Equipment

Westec Tank & Equipment offers 100 to 350,000-gallon stainless steel tanks, fabricated by welders with years of experience in the manufacture of stainless steel products.

The VT self-contained wine tank will heat or cool wine all within one unit, runs off 220V power, can be configured in open-top, closed-top, floating top, or removable top. This versatile wine tank allows winemakers great flexibility to experiment on small batch wines.

In 2004, the OX-BOX (a micro-oxygenation process) was introduced. This micro-oxygenation process occurs in stainless steel instead of oak barrels. When combined with the VT wine tank, two pieces of equipment become just one.

THE BELLI CORPORATION
WESTEC
TANK & EQUIPMENT, CO.

The Belli Corporation provides stainless steel tanks for many uses, catwalks, sump carts, and many more specialty items fabricated to the specifications of each winemaker.

For more information, contact:
Westec Tank & Equipment
Joe Belli, Jim Belli, Mark McDowell
1402 Grove St., Healdsburg, CA 95448
tel: 707/431-9342; fax: 707/431-8809

PLEASE SEE WESTEC TANK AD, PAGE 83.

Paul Mueller Company

Paul Mueller Company manufactures and field installs a broad line of wine processing equipment, including fermentation and storage tanks, champagne tanks, de-juicing tanks, pomace removal tanks, rotary fermenters, Porta-Tanks®, falling film chillers, Accu-Therm® plate heat exchangers, thermal storage equipment, and all-stainless-steel wine barrels.

MUELLER
PROCESSING SYSTEMS AND EQUIPMENT

Mueller can custom design and manufacture specialized equipment. When the project is too big to ship in one piece or is located in tight quarters, Mueller Field Operations, Inc. will go to work for you.

Mueller's new tapered wine tank is available in insulated or single-wall versions. The novel design allows the grape cap to wedge into the upper part of the tapered shell, thus making it easier to re-submerse, enhancing extraction.

Paul Mueller Company has earned distinction for delivering outstanding equipment and unique solutions to the process industries since 1940. Mueller offers a full range of tanks/vessels, from shop-fabricated alloy vessels through 20-foot diameter, to field-fabricated vessels up to 2,000,000 gallons. They provide process solutions by offering integrated systems, modular fabrication, field construction, plant maintenance and repair, and complete turnkey project execution.

Mueller has the technical expertise, innovative engineering, and manufacturing resources to implement a process system specific to your needs.

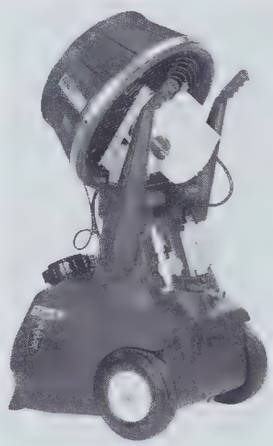
For more information, contact:
Paul Mueller Company
Paul Hume, National Sales Manager
David Rowe, Regional Sales Manager
PO Box 828, Springfield, MO 65801-0828
tel: 1-800-MUELLER; 417/831-3000
fax: 417/575-9669
e-mail: processing@muel.com
website: www.muel.com

PLEASE SEE PAUL MUELLER AD, PAGE 68.

Jaybird Manufacturing, Inc.

Jaybird manufactures a commercial line of fine-mist fogging units, perfectly suited for wine storage humidification. With three major product lines to choose from, Jaybird has units to suit any size barrel room. From durable mobile floor units to hanging fan units, Jaybird brings all the advantages of high-tech fogging down to simple stand-alone independent units.

Enormously powerful and attractively priced, Aquafog® humidifying fans do not require high-pressure pumps or massive air supplies for operation. The nozzle-free units connect and operate from ordinary utility supplies and have fully adjustable fogging output capability.



- **HRSM™** — Compact, powerful, and built like a tank, with pivoting fogging head that can deliver high quality fog anywhere you need it,
- **Turbo XE fans™** have all the power with added versatility and minimal investment. Humidifies up to 40,000 cu. ft.,
- **Aquafog® 400** brings advanced fine-mist fogging to the small winery, with quiet, hanging units for areas up to 3,000 cu. ft.

Discover the practical way of humidifying your barrel rooms with Aquafog®, the industry leader in centrifugal atomizers for over 18 years. Made in U.S.A.

For more information, contact:
Jaybird Manufacturing, Inc.
2595-B Clyde Ave., State College, PA 16801
tel: 888/889-4407; fax: 814/235-1827
e-mail: info@jaybird-mfg.com
website: www.jaybird-mfg.com

PLEASE SEE JAYBIRD MANUFACTURING AD, PAGE 88.

RLS Equipment Co., Inc.

RLS Equipment Company, Inc., has provided wineries with quality equipment and service for more than 40 years. As agent for Kiesel, Magitec, Strassburger, Amos, and Moeschle, RLS can supply complete crushing and pressing facilities.

Kiesel progressive-cavity pumps are available in both hopper and in-line styles from 1,000 liters per hour to more than 200+ ton per hour (tph). The unique Kiesel "corrugated" tube-in-tube heat exchangers can process from hundreds to thousands of gallons per hour, and save $$$ in energy costs.

RLS

Strassburger's MCC Crossflow Filtration system is a completely PLC-controlled unit that allows highly-flexible control, and the unique design yields one of the lowest recirculation rates (less pumping of wine). Strassburger also offers high-quality plate/frame, and lees filters. S/S construction with either S/S or noryl plates are durable and easy to clean. A wide variety of filter pads is available.

Magitec stemmer/crushers are available from 2.5 tph to 60+tph capacity with Magitec's unique square-hole basket. Magitec offers a variable-speed, dual-drive system (basket/beater bar) on small units and split machines with vibrator sorting tables between stemming and crushing.

Moeschle offers both cylindrical and rectangular s/s tanks, custom-designed to specific customer requirements.

RLS offers domestically-produced replacement membranes for most presses, a complete line of genuine Amos stemmer-crushers and parts, and an extensive used equipment listing.

For more information, contact:
RLS Equipment Co., Inc.
1017 White Horse Pike
Egg Harbor, NJ 08215
tel: 609/965-0074 or
West Coast tel: 800/527-0197
fax: 609/965-2509
e-mail: rls.equip@worldnet.att.net
website: www.rlsequipment.com

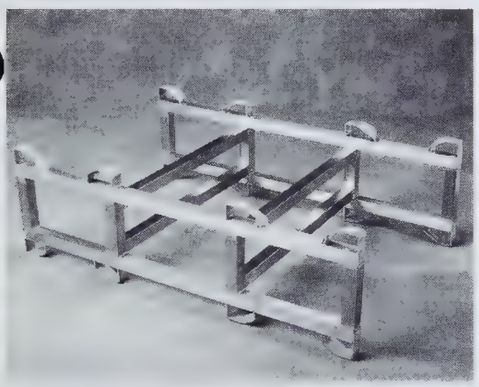
PLEASE SEE RLS EQUIPMENT AD, PAGE 22.

G.W. Kent, inc.

G.W. Kent has supplied wineries, breweries, and beverage industries since 1985. The company has a catalog and an online store with a full line of winery equipment and supply needs, including:

- destemming, crushing, and sorting equipment;
- refractometers and other testing instruments;
- bins;
- presses;
- tanks;
- valves;
- fittings;
- filters;
- pumps;
- gauges;
- corkers and fillers;
- corks;
- capsuling and labeling machines

and more!



G.W. Kent stainless steel barrel racks have replaced many rusty metal barrel racks in wineries all over the U.S. In addition to offering racks that outshine the competition, G.W. Kent offers competitive prices and quick delivery from stock, or custom production. By reducing winery labor and maintenance costs, stainless steel racks are an investment that pays for itself in less than three years.

Shop for racks and much more. Order a catalog or shop online at gwkent.com.

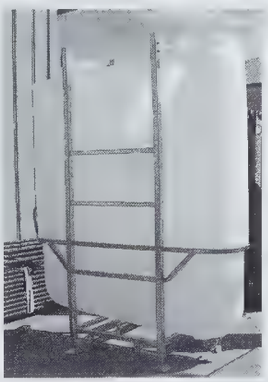
For more information, contact:
G.W. Kent, Inc.
506 S. Huron, Ypsilanti, MI 48197
tel: 800/333-4288, or 734/572-1300
e-mail: info@gwkent.com
website: www.gwkent.com

PLEASE SEE G.W. KENT AD, PAGE 11.

Flextank, inc.

Oak wine barrels are one of the few pre-industrial revolution items still in regular use and essentially unchanged for centuries. They perform three fundamental functions in the maturation of wine — containment, flavor addition, and oxygen permeability, which facilitates complex changes during the aging of high-quality wine.

Flextank's patent-pending maturation vessels provide all of these functions with more winemaker control, in a hygienic and long-lasting vessel made from high-density polyethylene (HDPE). Vessels are available in a range of sizes from 50 to 600 gallons that behave like a second-year barrel in terms of oxygen permeability.



The first 600-gallon maturation vessel produced in California.

Consistency of performance between vessels, and the availability of a wide range of oak adjuncts in the form of staves, chips, spirals, blocks, etc. allows a winemaker a veritable smorgasbord of opportunity to experiment with flavor in a reproducible environment.

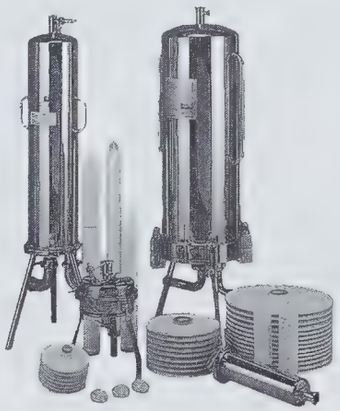
Used in Australia since the 2004 vintage, Flextank vessels are producing trophy-winning wines, including the top Pinot Noir at the prestigious 2006 Royal Melbourne Wine Show. The success is attributed to retention of volatile flavor compounds lost from barrels, and the much-improved hygiene. In addition to improving quality, the vessels offer compelling cost advantages when compared with traditional barrels.

For more information, contact:
Flextank, Inc.
1200 Knob Creek Dr., Athens, GA, 30606
tel: 706/316-1622; fax: 706/534-8704
e-mail: john@flextank.biz
website: www.flextank.biz

PLEASE SEE FLEXTANK AD, PAGE 56.

CUNO incorporated

CUNO is a world leader in the design and manufacturing of a comprehensive line of filtration products and systems for clarification and final filtration of fine wines.



Innovative CUNO products for wine filtration include the first dual-zone clarification depth filter cartridge (Zeta Plus Maximizer), the first integral multi-zoned membrane prefilter (LifeASSURE®) and the first nylon-based final membrane filter optimized for repetitive hot water exposure (BevASSURE®).

CUNO has recently added to this impressive list the BevASSURE PES line of final membrane filters. BevASSURE PES, a new, polyethersulfone membrane final filter that combines three innovative technologies from CUNO to drastically improve filter throughput and drive down operating costs. A highly asymmetric microporous membrane, a patented pleating design, and a novel, patent-pending support layer construction, work in concert to deliver ultra-fast flow rates, secure spoilage organism retention, and remarkable throughput.

With over 90 years of experience and manufacturing facilities on five continents, CUNO is uniquely suited to provide solutions to wineries worldwide.

For more information, contact:
CUNO Incorporated
a 3M company
400 Research Pkwy., Meriden, CT 06450
tel: 800/243-6894; fax 203/630-4530
e-mail: cjohara@mmm.com
website: www.cuno.com

KLR Machines, Inc.

Let KLR Machines, Inc. (the Bucher Vaslin distributor for North America) introduce you to the most up-to-date equipment for the U.S. wine industry.

Bucher is a world leader in both the wine- and fruit-processing market, maintaining 50% of the world market share for the wine industry (reception and pressing), and 60% of the market share in the fruit industry.

Bucher Vaslin is continually monitoring and analyzing the wine market to respond to needs of the industry through new technologies and innovation. The complete line of Bucher Vaslin equipment is developed by expert factory technicians, designed to work in-line from grape reception through processing. The various capacities accommodate small-, mid-, and large-size wineries alike.

New in 2007 is the Inert Gas Press (from 50Hl capacity and higher), which preserves 100% of pressed juice from oxidation.

KLR Machines announces their distribution partner for the Pacific Northwest, Pacific Winemaking, who can be contacted at info@pacificwinemaking.com.

To obtain more information about Bucher Vaslin lines of equipment and Begerow equipment and filter media, please visit klrmachines.com or call 707/823-2883.

For more information, contact:
KLR Machines, Inc.
350 Morris St. Ste. E, Sebastopol, CA 84572
tel: 707/823-2883; fax: 707/823-6954
Bath, NY 14810
tel: 607/622-5189
website: www.klrmachines.com

PLEASE SEE KLR MACHINES AD, PAGE 49.

Pickering Winery Supply

Santa Rosa Stainless Steel has been a recognized leader in the production of stainless steel tanks for dejuicing, fermenting, and storage since 1968. Over 900 wineries worldwide own more than 21,000 of their tanks. Known for their quality, reliability, integrity and innovation, their production ranges from the smallest portatank to over 700,000 gallons. Their new conical wine tank, intended to enhance delestage or "rack and return," is their most recent innovation.

Aside from the excellence of design and the quality of the welding, what also distinguishes Santa Rosa Stainless is its unquestioned reputation for on-time delivery. No project is undertaken without a thorough study of the time constraints for the completion of any job. Exceptional quality at competitive prices, combined with unparalleled service, enables Santa Rosa Stainless Steel to maintain its position of leadership year after year. Pickering Winery Supply is pleased to be the agent for SRSS tanks.

W.E. Ware & Co., (Adelaide, Australia) has been making products for the wine industry since 1927. They specialize in stainless steel winery equipment, including fittings, mixers, barrel washers, sulfphitometers, valves, and many related products. Visit their website at www.wewareware.com.au.

For more information, contact:
Pickering Winery Supply
888 Post St., San Francisco, CA 94109
tel: 415/474-1588; fax: 415/474-1617
e-mail: pickering@sbcglobal.net
website: www.winerystuff.com

PLEASE SEE PICKERING WINERY SUPPLY AD, PAGE 98.

Scott Laboratories, Inc.

Continued innovation by Scott Labs and Vaucher-Beguet has resulted in increased speed and efficiency. In 2006, sorting was performed from 2 to 10 tons/hr at 10 installations throughout the western U.S. and Ontario, Canada.

The 2006 harvest proved Vaucher-Beguet sorting tables to be as efficient in effect, yet economic in cost, compared to the most advanced competition. The Mistral, however, offered a level of selection unparalleled in the industry. Winemakers already using this technology have found that not only has overall must and wine quality improved, but the automation has also led to economic efficiencies in labor and time. Mistral's modular design allows a winemaker to customize the intensity of selection and capacity of production to suit quality and production demands.

The increased practice of sorting has led to greater scrutiny of destemmers and their ability to provide whole berries. Armbruster Destemmers can handle the job. Field trials have strengthened Armbruster's ability and reputation for providing a high percentage of whole berries, with a small amount of jacks when compared to other units processing the same fruit.

For more information regarding Armbruster and Vaucher-Beguet products and references, please contact Scott Labs or visit booth 601 at the 2007 Unified Symposium in Sacramento, CA.

For more information, contact:
Scott Laboratories, Inc.
2220 Pine View Way, Petaluma, CA 94954
tel: 707/765-6666; fax: 707/765-6674
e-mail: info@scottlabs.com
website: www.scottlabs.com

PLEASE SEE SCOTT LABS AD, PAGE 64.

Napa Fermentation Supplies

Napa Fermentation Supplies offers a full line of winemaking equipment and supplies, including stainless steel tanks in variable capacity with adjustable lids from 26 gallons to 2,693 gallons and closed-top tanks from 79 gallons to 5,221 gallons, with or without manway and with or without cooling.

Also available are: Karcher hot water pressure washers with 1,300 psi to 3,000 psi and temperatures from 86°F to 285°F steam; one-inch and 1.5-inch Jabsco pumps with AC inverter drive; two-inch or three-inch Zambelli must pumps with AC inverter drive; Zambelli crusher/destemmers from two to 14 tons per hour; Zambelli manual and hydraulic, membrane, and bladder presses; eight-inch and 16-inch Zambelli plate filters; a full line of stainless steel fittings and valves, butterfly and ball; one-inch to four-inch wine hose; labware; refractometers; wine thieves; and table-top labelers.

Now offering the reliable, accurate, and easy to clean Demoisy GALEO destemmer from France. Demoisy destemmers have a revolving stem cage with stamped holes, revolving shaft with rubber fingers, and two separate motors for shaft and cage. They are easily dismantled by one person and have a built-in washing pipe, and optional variable speed for the feed screw and cage are available.

For more information, contact:

Napa Fermentation Supplies
575 Third St., Bldg. A, Napa, CA 94559
tel: 707/255-6372; fax: 707/255-6462
website: www.napafermentation.com

PLEASE SEE NAPA FERMENTATION AD, PAGE 93.

Raynox 2000, Inc.

Raynox 2000 Inc. is a manufacturer of high-quality stainless steel tanks and equipment for the wine industry. With high standards for fabrication, welding and polishing, Raynox tanks are made to customer's specifications. Should you require variable-capacity tanks, closed-top tanks with or without cooling jackets, or rectangular tanks to maximize winemaking space, Raynox supplies high quality at competitive prices.

Through the years, Raynox has expanded beyond tank fabrication, and also produces winemaking equipment: plate and frame filters, cartridge filter housings, pneumatic membrane presses, must pumps, and ozone sterilization systems. Raynox carries a wide range of accessories such as valves, tri-clamp fittings and seals.

Raynox tanks are sold throughout the mid-west and east coast of the U.S. and in the Niagara region and southern area of Ontario, Canada, the province of Quebec, and the Canadian west coast.

For more information, contact:

Raynox 2000, Inc.
Sales Department
1148 St. Michel St., St-Cesaire
Quebec, Canada J0L 1T0
tel: 866/469-4181 (toll free)
fax: 450/469-2112
e-mail: raynox@raynoxinc.com
website: www.raynoxinc.com

PLEASE SEE RAYNOX AD, PAGE 60.

P&L Specialties

New in 2007 is an automated Picking Lug (Yellow Box) Washing Machine that features cold water rinse and 180°F sanitation zones. The water tanks screen and collect solids, recycling the water. UL controls adjust washing time and water temperature. The unit is constructed entirely of stainless steel, utilizing the finest components and craftsmanship. Customers report saving energy, water, and labor.

The industry's best selling M.O.G. separator has gotten even better. The Le Trieur™ (patent pending) or "LT" has been improved and features upper-end throughput of five tons per hour, remote controller, and casters for portability. The new larger LT2+2™ (patent pending) provides efficient automatic elimination of shot berries, raisins, and petioles at 10 to 12 tons per hour.

P&L Specialties is proud to distribute SUTTER Pneumatic Membrane Presses. SUTTER presses are recognized as premier products delivering excellent results. Innovative design provides precise pressing control, easy operation, and world-class Swiss reliability. Well-equipped SUTTER presses are available in open-slotted style or closed-tank press configurations. Sizes: 10hl to 150hl.

P&L Specialties offers the "ounce of prevention" pre-harvest, crush, and post-season service for its equipment lines: P&L, Sutter, and CME.

2007–2008 projects? For best results, begin design discussions early. Please call soon for an appointment.

For more information, contact:

P&L Specialties
1650 Almar Pkwy., Santa Rosa, CA 95403
tel: 707/573-3141; toll-free: 888/313-7947
fax: 707/573-3140
e-mail: sales@pnlspecialties.com
website: www.pnlspecialties.com

PLEASE SEE P&L SPECIALTIES AD, PAGE 72.

Critical Environment Technologies

Detection of carbon dioxide is an important part of winery workplace safety. People die every year from exposure to high concentrations of CO_2.

Monitoring fermentation areas or vessels for dangerous concentrations of CO_2 is an essential part of maintaining a safe workplace. Handheld instruments can make air quality monitoring simple, and datalogging capability can create records to prove compliance. Temperature and RH can be measured to optimize environmental conditions.

Installing a CO_2 detection system to monitor the concentration of CO_2 in the fermentation area and automatically activate ventilation equipment is an effective way to ensure the area is safe and to ensure compliance with workplace safety regulations such as OSHA.

Carbon Dioxide exists normally in air at concentrations between 300 and 600 ppm. Exposure to moderately higher concentrations may produce headache, sleepiness or dizziness. Prolonged exposure to high concentrations of CO_2 can be fatal.

Critical Environment Technologies manufactures both handheld air quality monitors and fixed systems. Gases detected include CO_2, ammonia, refrigerants, carbon monoxide, SO_2, NO_2, chlorine and many more. CET instruments can be configured to suit any application, from small to large.

For more information, contact:
Critical Environment Technologies
Bob Davidson
toll-free: 877/940-8741
e-mail: marketing@cetci.com
website: www.critical-environment.com

Pulsair Systems, Inc.

Pulsair is an innovative company that has brought a new technology to winemaking called Pneumatage — a new method for making wine! Pneumatage is changing the way people think about drinking wine, buying wine, and storing wine. Pneumatage makes better wine faster that is more drinkable sooner and therefore, no matter the arguments, better for the bottom line. Moreover, Pneumatage can be automated. It takes over where other systems are just starting.

Pulsair™
SYSTEMS, INC.

Pneumatage automates the fermentation cycle leaving the winemaker to do what they do best — make wine. The winemaker is now free to test, examine, evaluate, and taste the wine during fermentation and not worry about the daily chores of turnovers, labor management, and paperwork and, when the wine is finished, the data can be downloaded for future use.

The Pulsair hand-held PTM-2002W allows small wineries to turn the cap from the top or through the racking port. The portable Wine Cart expands the ability of the PTM to mix larger tanks in a semi-automatic mode. Pneumatage Light allows programming of a fermentation cycle. The fully programmable Pneumatage System will turn multiple tanks on a predetermined time schedule for 14 days. More than 100 tanks can be operated from one central controller. When you're through, any Pulsair system can be used to quickly mix and blend to create a great Estate Vintage.

For more information, contact:
Pulsair Systems, Inc.
tel: 425/455-1263, or toll free: 800/582-7797
e-mail: sales@pulsair.com.

PLEASE SEE PULSAIR SYSTEMS AD, PAGE 68.

Electro-Steam Generator Corp.

Electro-Steam Generator Corp. has manufactured all-electric steam generators since 1952.

The generators operate at 98% efficiency and produce culinary-grade steam. They are designed for point-of-use placement or with portable mounting. Some of the many uses include: sterilizing bottling lines, melting tartrates, refurbishing barrels, and general cleaning.

Because there is no open flame, Electro-Steam generators are safe to operate resulting in lower insurance costs.

Basic maintenance will extend the life of an Electro-Steam unit by many years.

Each generator is hand-built to meet your requirements. The units are manufactured under the ASME Code, are national board of PVI shop-inspected, and UL- and ETL-certified. CSA certification is provided upon request.

For more information, contact:
Electro-Steam Generator Corp.
PO Box 438, Rancocas, NJ, 08073
tel: 866/617-0764; fax: 866/617-0765
e-mail: jharlin@electrosteam.com
website: www.electrosteam.com

CEO INTERVIEWS

Wine business strategies for a global industry

BY Robert Smiley, PhD, Professor of Management, Director of Wine Studies, University of California Davis, and Josephine Tuchel, Research Assistant

Editor's Note: Robert Smiley conducted telephone interviews with 30 CEOs in the wine industry to obtain responses to five questions about business strategies for the global wine industry. He presented his findings to the Wine Industry Financial Symposium in September 2006 in Napa, CA.

Respondent replies to the questions are not identified. Smiley interviewed: two growers, one wine/grape broker, one distributor, six Napa Valley wineries (large and small), and three Sonoma County wineries. Large producers include: Constellation Wines, Diageo Chateau & Estates, Fosters Wine Estates Americas, E&J Gallo Winery, and Kendall-Jackson Wine Estates. Seventeen additional California wineries and companies producing wine also responded to Smiley's survey.

PWV hopes readers enjoy reviewing the responses on successful strategies.

Q. Is the global wine oversupply here to stay, and how does it affect your business?

Cyclical

- It's basically a cyclical situation. The long-term supply and demand will come into balance, but it will take a long time to do this. It is taking a particularly long time this time around because of the problem in Europe and Australia. However, for a global company, this situation affords opportunities for cost savings.
- Forever? No, at a certain point no one will lose money forever on excess wine. Today, the issues are different production costs in different areas. Chile and Argentina are low-cost producers and if they can maintain this, there will be a downward force on pricing throughout the industry. The Australians are realizing that their long-range plan isn't working out as they had expected. They're in oversupply now, but it won't stay this way as they pull grapevines and fix up their problem through the free market.
- It won't go away quickly. A good indication of what can possibly happen will be how Australia reacts to their current situation. If the government steps in and helps, the solution will come more quickly. If not, it will take longer.
- Grapes are such a high value-added commodity for so many areas and it's such an interesting and challenging and prestigious thing to do that people are planting anywhere in the world where things can be planted. New plantings are also going in at higher density and getting higher yields.

In Spain, they are switching to irrigation and went from dry land yields of less than one ton, to irrigated yields of six tons or more per acre. It makes a dramatic difference in production. Also, Spain has the largest acreage devoted to grapes right now, and there is water available. Spain has the opportunity to increase production more than any other country. China is also a large potential producer.

Domestic issues

We have to be very careful about the imports globally. Australia is a good example because they'll do just what the Japanese did with autos 30 or 40 years ago. They made them cheap — really cheap. Then they were good. Then they became really good. Now they have become luxury. Whether they have a concise strategy or not, they have a strategy. They came in cheap and they did that well. And they're coming up with $15 and $20 bottles of wine. Now they pose a real threat to premium wines at $30 and up. South Africa, Chile and Argentina will all have to do the same thing.

Summary

- Due to the agricultural nature of business and the appeal of the industry, oversupply will continue in a cyclical pattern (although the length of the cycle may be longer).
- Many are hopeful that increasing domestic consumption (as well as increasing consumption worldwide) will help to absorb some of the excess wine that comes from oversupply of grapes.
- The oversupply is not universal and in the near future, we may experience shortages in the U.S., especially when it comes to premium grapes and middle- to high-end wines.

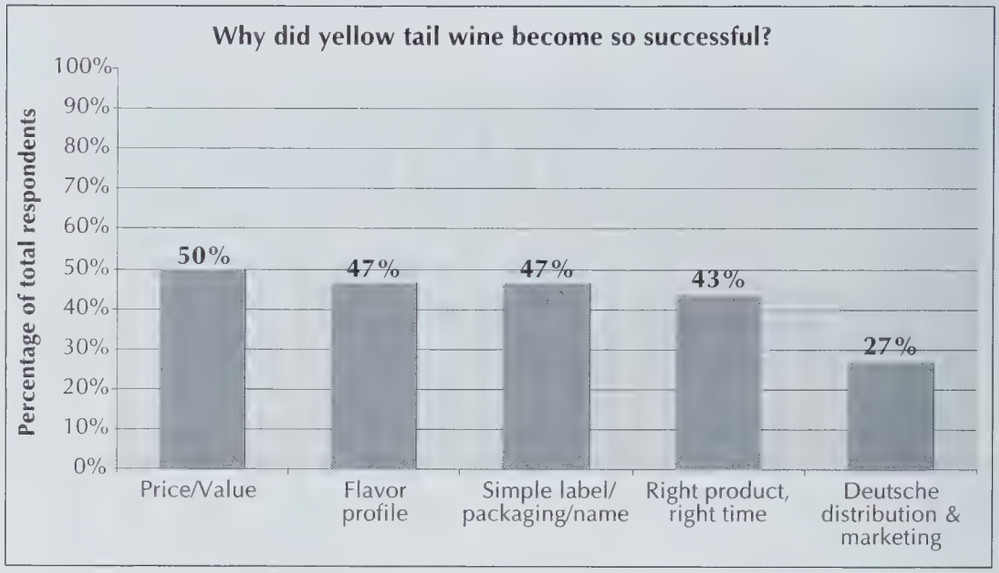
Q. Will there be an end to distributor consolidation, and what will be the ultimate market structure?

Drivers

- Retailers are forcing this somewhat because they want to deal with a single wholesaler coast-to-coast. There is more energy on the part of large customers to have coverage overall. We see it particularly on the on-premise side.
- There is a huge economic basis for consolidation to continue. The large on- and off-premise customers de-

mand a level of service and support that requires distributors to become larger so they can centralize with consistent support, pricing, marketing, ans service.

• Consolidation will continue because a lot of the distribution companies have been around since the repeal and, like in any industry, new generations don't have the interest in doing the same things their families may have done. They may want to branch out into other areas or industries. Some people might want to cash in and take money out so they can enjoy their current lives or share their wealth with their families. It isn't very different from other businesses.



Few large, national companies and several small, regional companies

• There will be two market structures. One, there will be continuing consolidation of the big guys because the medium-size guys can't stand up to them. Two, there are small distributorships springing up everywhere that are going for the small, high-end wines.

Two-Tier

We are seeing compression of the three tiers. We could see it come down to a two-tier system and perhaps even a one-tier system for some. It does feel more like we are headed in a two-tier direction. The producer tier will remain and whether the retailer or wholesaler will eventually win in the market place remains to be seen. Wholesalers may become major retailers in some markets merging their concepts with their delivery capability and may morph into delivery to consumers. The regulatory framework appears that it will allow this as some point. The opportunity is there and the expertise is there, so it seems to be a battle between retailers and wholesalers over the consumer.

Summary

• Consolidation has been occurring for some time on a regional basis and is now transitioning toward on a more national basis.

• Spirits companies and retailers are key players driving wholesaler consolidation.

• New, smaller, more niche-focused distributors will continue to appear to fill a void in service realized by both producers and retailers.

• Legislation will be an important factor in the development of distributor consolidation and evolution of their role in the 3-tier system. There are expectations that the 3-tier may become a 2-tier system and that wholesalers may become retailers themselves.

Q. What is responsible for the "Yellow tail" phenomenon, and what can we learn from it?

Perfect Storm

• It was kind of a perfect storm scenario. They came in with a product that was flavorful, and had an un-intimidating label, and found a price-point that was somewhat evacuated by Australian producers: Rosemount and Lindemans. It is a consumer-driven phenomenon more than any successful supplier or wholesaler program. It got put out there and people just started picking it up. No one saw it coming. A lot of wholesalers rejected it initially saying they already had enough Australian wine, saying that the label was simple and whimsical. But it touched an audience that knew they liked wine but didn't want to be intimidated by wine — and the whimsical label and low-barrier wine was attractive.

• It was a series of really fortunate coincidences: package, wine quality, wine style (sweeter — it sells). Australia was a hot category and had a good currency advantage when they got started. Also, the Southcorp merger created a vacuum of distribution that was really unique. It's not something that is a regular occurrence — like wine quality.

Distribution assistance

Casella Winery (producer of yellow tail) got a combination of branding and flavor profile that was exactly right for the consumer at exactly the right time. So, just when there was a bunch of new consumers coming into wine, they had an accessible, easy to understand, colorful, consumer-branded product with a sensory profile that is no one's favorite but everyone's #2.

• Yellow tail has taken the bulk wines that had previously been going into Lindeman's or something else and put them in a different distribution system that caught the particular fancy of the time.

Innovation

• Going out on a limb, being more creative with the flavor profile was the foundation of its success. We can learn, to a certain degree, about breaking the mold on the flavor profile and about trying something new. Some years ago

Jess Jackson did this with his Vintners Reserve Chardonnay with tremendous success. The packaging, the simplistic name, its Australian origin and cute label all contributed, but flavor is mostly what got yellow tail going.

- Yellow tail was successful because it was a differentiated product that had strong flavors of sugar and oak, which about 30% of the population likes. They moved into a value situation where they offered it at a really reasonable price and then product knowledge spread by word of mouth. The symbol on the label gave it timelessness. The package supported the product. They were a first-mover with this sort of product (the flavor, label, etc.).
- All the top companies are losing market share today. The consumer always wants to try something new and different. If you want to keep pace with the market, you have to be tremendous at innovation. New products, interesting labels, quality.

Summary

- Mass appeal of a consumer product has happened before and will happen again. Hanging on to the attention of the customer will be the challenge.
- Understanding what appeals to a consumer in a particular market (such as sweet wines in the U.S.) is important, but Yellowtail was able to separate itself on the shelf and in the minds of consumers with the simple name, simple and bright packaging, and affordable price that made people feel that they were getting a great deal on a good wine.
- Increased turnover in brands' appeal will increase the speed at which producers will need to innovate their products, labels, quality, etc.
- Distribution was one of the key factors in this phenomenon.

Q. What do you consider to be the hottest issues over the next five years?

Consumers

- We'll see a flattening of the price spectrum. Ultra-premium wines are doing well right now and will continue to do well, but as wine becomes more of an everyday beverage for most people, it just isn't in the American budget to sit down and crack up a $20 bottle every night. You'll see a reversion to economically-priced wines that people use for every day. It will be about the quality and price ratio
- Brand equity will go away in five years. Brand life cycles will be much shorter and will be replaced by commoditization of the product that will be sold based on quality and margins will get really thin. Basically, the market will mature. The retailer will decide what gets put on the shelf — so the retailer will be in the driver's seat. They will put out the best value that they can find (a private label or a label that the winery develops, but neither will be a long-term brand) and the consumer will win by getting to buy really good wine really inexpensively.
- Everyone in the trade (the producers' side) in the U.S. is trained to sell on price, but this is fatal. It would be nice to see an awakening toward selling on value. Everyone is trying to sell on price. These pricing games are happening (pricing up, pricing down) to get wine out there and it takes a lot of energy (wastes a lot of energy). People should be saying that this is what my wine costs and stick with it. It would be better to spend that energy (now spent on pricing) on marketing – the market would grow.
- The era of the great entrepreneur is past. The proliferation of brands that we saw in the 1970s and 1980s and a little bit in the 1990s, represented an interesting group of people who came in – primarily in Napa and Sonoma – with some money and some fun and some passion and the industry was young and changing and vibrant. Now the business is maturing and will become more difficult. It won't be as fun anymore. It will be difficult for families to pass on to younger generations, more difficult to come out as a fun brand. More professionalization will continue to make it a more mature business.

The Environment

- Sustainability, air quality, environmental issues. It's been on people's radar screen for a while but it's picking up momentum. How viable or competitive will California be in many of the segments that we compete in now? In the Central Valley, it will be difficult for companies to expand production and winery capacity because of air quality regulations that are being implemented. This will raise costs which will result in an increasing focus on imports.
- Future planning for capacity. The Central Valley Air Quality Board regulations get expensive and require largely unavailable "credits" to be able to add fermentation capacity. It's not a new issue, but it is becoming a bigger topic and, in five years time, we'll accelerate the drift to imports unless the regulatory environment changes.

Research

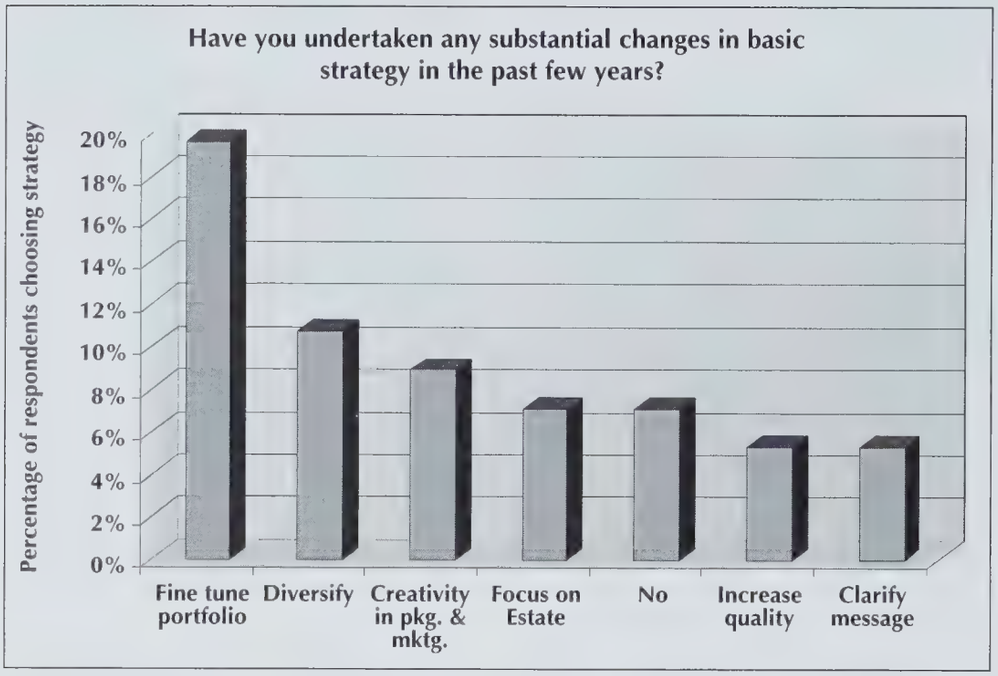
- One of the biggest things is that we are losing out in research. We just aren't funding and focusing on getting research results out. In the terroir conference in Bordeaux with 18 countries represented, 12 to 15 of them had detailed studies starting with GPS of all the climate, soil, humidity, heat, rainfall, etc. so that they are recommending where to plant. We're not doing that. There has been one study from Oregon, but nothing from California.

Labor

The labor supply will get tighter and tighter. We are seeing it already this year. It has been talked a lot about for the last few years and has been in the press a lot, but California hadn't seen it until this year — but it is here this year.

Food and Wine

Pairing will become much more prominent and important as fusion foods become more prevalent. The world is becoming smaller with flavors — and the awareness of flavors is increasing. There are many interesting flavor bases — Indian, South American, and Asian — and more foods will increasingly be made around wine. For example, Asian foods will be made to bring tannins into play.



Regulation

- The challenge of the 21st amendment and that the Costco case is just the beginning of a whole reexamination of the future of the distribution system. There are going to be a lot of legal opinions that come out of that ruling and how it affects the entire industry: direct shipping, franchise law, etc. The 21st amendment will go through a serious examination.
- Direct shipping issues will continue because distributors are so dead-set against it. The result will probably be a spawning of direct shipping companies that will do it for you (take care of taxes, etc.).

Summary

What is important to the consumer:

- The flavor profile popular among consumers will be important.
- Customers may become increasingly concerned with the way that grapes are grown and the ingredients that go into a wine.
- As more wine is consumed, customers will also be concerned with the price they are paying to drink wine on an everyday basis.
- Environmental issues
- Shorter brand life cycles will reduce margins for producers. Retailers (most connected with the consumers' demands) will drive those brand selections.
- The importance of science and research on how and where to plant.
- Regulatory changes and new business developments as outcomes of the Costco case and other direct shipping court cases.

Q. What changes in strategy have you undergone in the previous two years?

Portfolio Management

- Focus the portfolio by bringing it down to a few manageable SKU's that they can do well and focus on moving their entire portfolio to be estatedriven.
- Increased the rate of repositioning: Trying to differentiate all products in their portfolio. Focusing more toward higher prices, imagery campaigns (marketing), and sourcing solutions (move from "California" to "estate grown").
- Elevating and simplifying the product line. Simplify the message by making it very clear what is in the bottle. There is a need to make it easier for the consumer and distributor to know what they're getting from a winery. Repositioning to focus on Napa wines (from owned vineyards) where they can get a higher price point. Focus on sense of place and make the appellation as small as possible because it gives a better story and allows them to raise price.

Means of Growth

Bullish about business: Growing significantly through brands, acquisitions, etc. Their strategy is based around having a very diverse portfolio of wines that have a lot of differentiation and reasons for being and that offer consumers a choice. The key to this strategy is how to take the advantages of size and scale but still assure the consumer of the variety and diversity they're seeking.

How to Remain Competitive

- Looking more closely at what is a more bifurcated wine business and having decided to circle the wagons in an estate-based approach and are working only with estate fruit going forward, farming it ourselves, and not even dabbling in volume-driven wines. Feel that we can't compete against many players out there on economy of scale, but can be successful and competitive on the artisan side.
- Properly structure the balance sheet for the cycles: It is increasingly important to attune to the proper capitalization for market cycles. People will need a little more equity consolidation, and globalization will make the amplitude of the wine cycles a little more difficult.
- The world isn't as nice a place as it was a few years ago and we are focusing a little less effort on some of the export markets and a little more on the U.S. market. Russia is going backwards in terms of its transparency of business. The discount concept in Europe is putting severe margin- and price-pressures on the grocery groups. The wine glut probably won't help this.

Summary

- Shifting focus toward estate-based products.
- Respondents are split as to whether they are going to put focus more on the domestic market or foreign markets.
- As the wine industry matures, there is an increasing need for creative packaging and marketing.
- Growing through acquisitions of established brands.
- Clarifying the message and simplifying the product line to better communicate with customers (distributors, retailers, consumers).

RAVE

Recent Advances in Viticulture & Enology

March 22, 2007
Freeborn Hall
UC Davis

Measuring / manipulating phenolics

In an ongoing effort to share the latest applied research and to facilitate communication with the wine industry, The Trellis Alliance and University of California, Davis Department of Viticulture & Enology co-sponsor Recent Advances in Viticulture and Enology (RAVE) annually. It will be held at Freeborn Hall, UC Davis on Thursday, March 22.

The goal of RAVE is to encourage interaction between researchers who are actively pursuing applied research and the winegrape and winemaking industries, who will ultimately benefit most from results of the research. All attendees receive a complimentary one-year membership in the Trellis Alliance with registration.

RAVE 2007 will focus on the measurement, understanding, and appreciation of some of the most important, yet least understood compounds in grapes and wine — the phenolics. Phenolic compounds play key roles in red wines. They are responsible for color, color stability, mouthfeel, structure, and ageability.

TOPICS INCLUDE

Why a practical phenolics assay was needed? How the Adams-Harbertson Phenolics Panel has evolved to meet those needs. What have researchers learned about the fate of grape tannins and anthocyanins during the ripening and winemaking processes? Why a predictive model using UV-vis spectroscopy was chosen to enhance the practicality of the tannin assay? How the UV-vis model has been used in Australia and California.

The goal of several recent research projects at UC Davis has been to develop a simple, practical tool for winemakers and viticulturists that would allow accurate, yet timely measurement of the various classes of phenolics in grapes, juice, and wine: anthocyanins, tannins, and polymeric pigments.

The Adams-Harbertson tannin assay, developed at UC Davis by Dr. Doug Adams and Dr. Jim Harbertson, is now commercially available. More than five years of research and thousands of data points in red varietals, and some in whites, too, validate the assay. The requirements for only minimal training to perform this tannin assay, the minimal equipment requirements and low cost, and the ability to have credible, robust data in a timely fashion make it ideal for any size winery. Attendees will learn how to use this simple assay in their own labs to monitor changes in phenolic concentration throughout production.

Researchers at UC Davis and in Australia have been looking at the ability of UV-visible spectroscopy to predict phenolic composition as determined by the Adams-Harbertson assay. Any winery with access to a UV-vis spectrophotometer capable of reading 230-900 nm interfaced to a computer with Excel software, will be able to download the UC Davis model and generate values for all classes of phenolics in wine.

As winemakers come to appreciate these compounds and their evolution in grape ripening and in wine production, winemakers will learn how their manipulation can be come a very valuable tool in determining and directing wine style.

A panel of winemakers and enologists who are currently using the tannin assay to make critical decisions will discuss how it has impacted their decision-making. A tasting of wines with varying tannin concentrations will show how an understanding of the sensory aspects of tannins can be used with the quantitative analyses, to develop a vocabulary about phenolic perception. Results of recent research on the effects of micro-oxygenation on phenolics and flavor compounds in red wine will be presented.

REGISTRATION

The cost to attend is $220. To register for RAVE 2007, please see http://extension.ucdavis.edu/unit/winemaking/ or call UC Davis Extension at 800/752-0881.

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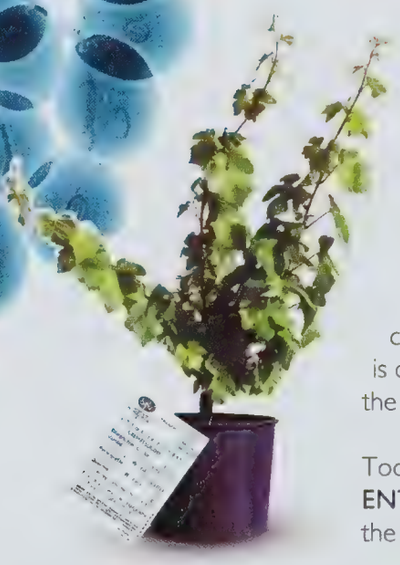

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PERSONNEL POINT OF VIEW *by Karen Petit*

Outsourcing your HR functions: Tips for a successful partnership

Do you need to devote dedicated, expert resources on your staff to interpret labor laws? Investigate a sexual harassment complaint? Recruit, hire, and train new employees? Terminate without fear of a lawsuit? Develop supervisory training programs?

It's tough enough running your winery operation day-to-day without having to struggle through the complexities and mysteries of the human resources (HR) field. Leadership at many wineries has elected to spend its time and energy determining how to meet the growth, profitability, quality, and production objectives of their organization rather than interpreting the implications of the latest employment law update. What about you?

However, the key driver of your results (good or bad) and the most significant risk to your success rests directly with your people. Consider the impact of poor performance, illegal employment practices, and communication breakdowns — these issues can cost you money but can also destroy your profitability and even threaten the continued success of your operation.

Your HR strategic plan can help you manage and control risks but can also contribute in a meaningful way to achieving your business objectives. Consider the impact of the following activities on both your short and long term objectives:

- Finding, hiring, and retaining top industry talent.
- Creating and implementing policies that allow for safe, legal, and compliant employment practices.
- Developing your managers' communication skills to motivate and engage employees.
- Implementing a performance management system that rewards people for their results and also holds them accountable for performance issues.

Can you afford an HR staff?

Prudent business practices mandate that *someone* keep an eye on the legal and compliance portions of your business. However, many wineries cannot justify the costs associated with hiring a full-time HR professional. Or, if they do allocate resources to full-time HR staff, most often those professionals can be best utilized if they are contributing to the strategic objectives of the organization rather than performing routine, administrative tasks.

A study by the Aegis Group (a leading marketing services company employing approximately 12,000 staff in over 60 countries) revealed that a full-time HR staff member is not fully efficient until the company has at least 110 employees. Even then, it may be difficult to bring on board the level of expertise and specialization needed.

Even large wineries with fully developed HR departments struggle with the challenges of remaining up-to-date with ever-changing regulations, claims processing, complaint procedures, and other employment law practices. If the changing labor laws have become too great in number, too complex, and too time-consuming for large wineries to manage effectively, how can a small winery address these critical functions?

Does outsourcing make sense?

One of the most efficient ways for small and mid-size wineries to take advantage of the economies of scale in the HR field is to consider outsourcing — or contracting — for all or part of their HR needs.

Outsourcing can make sense for many reasons. Even the largest wineries may find advantages in seeking the objectivity of an outside, third party for investigations and mediations. Through outsourcing, small wineries can tap into a wide range of resources and expertise that may not be available in-house. They gain access to professional experts whose sole focus is to stay current with the latest legal developments.

Efficiency and productivity gains can be realized by allowing internal staff to focus on their core duties without being distracted by the demands of HR projects. Employers can enjoy the technology, expertise, and experience typically available only to much larger organizations. Obtaining the services of an external HR consultant also allows a company to obtain a neutral, objective viewpoint, which can be very beneficial in a volatile or sensitive situation.

In addition to the financial benefits, outsourcing your HR function(s) allows you to focus on what you do best and what speaks to the heart of your business without diverting precious resources from the company mission and vision. Does your winery really want to be in the administrative personnel business? Does it drain company resources to spend time and effort on these issues.

Making the outsourcing decision

Deciding to outsource requires that you think about three things.

First, should you outsource at all? This decision will depend on the overall people strategy of your winery. What resources (time, money, people) are you willing to commit in-house? How much expertise do you have available to you? What are the risks?

Second, which HR activities do you want to outsource? Some wineries seek to build a long-term, strategic relationship with a partner, while others may contract for specific projects or short-term events. Many wineries choose to hire part-time people to handle routine, administrative tasks, others like to delegate those tasks and focus their in-house resources on the strategic, long-term activities that build the business.

Third, which partner(s) will you choose to work with? Once again, this isn't an all-or-nothing decision. You can use one partner for the tactical projects and another for the strategic. For example, many wineries choose one HR vendor to

process the payroll, benefitting from the technology and systems of a large company, while they choose a skilled consultant to develop a compensation strategy that will help them effectively hire and retain highly qualified managers.

What to outsource?

Outsourcing can be a powerful alternative for many wineries. But it's not a simple "Should I or shouldn't I?" question. Even if you decide outsourcing makes sense, you still need to figure out just what services you want an outside provider to supply.

There are four broad categories, or HR "levels," to consider as you work through this decision.

Level One: Administrative

Typically, administrative tasks require a high level of specialized expertise and dedicated resources. Many wineries are already outsourcing high-risk, full-time administrative tasks to professionals – tasks such as payroll, COBRA and benefits administration, and tax reporting.

Level Two: Compliance

Wineries will often decide to seek a partner to either develop or review current policies, procedures, and guidelines to ensure their compliance with employment practices. Such HR assessments can be conducted periodically as a winery grows and the needs change.

Most often, the need to review existing documentation will be especially relevant for rapidly growing and expanding wineries that may have an outdated (or non-existent!) employee handbook or have not considered the ramifications of reaching a critical employment law benchmark, such as employing more than 5, 15, 20, 25, or 50 workers.

Level Three: Talent Management

This category is the one most often left to chance. Often the owner, general manager, or financial department makes staffing and hiring decisions. Training and development are usually done as needed, if at all, by operational or functional managers, and succession planning is almost non-existent.

It's hard to focus on the long-term implications of attracting and retaining the *right* people, of developing the next generation of leaders and making sure all employees understand the mission, vision, and culture of the winery, while at the same time, trying to run your winery.

Seeking a partner in this category can take several directions. You may find that you simply want someone to do the tactical tasks like creating job descriptions and performance management forms. Or you may find you'd benefit from a strategic partner to help you assess the competencies of your staff and develop or provide recruiting support for an executive management team to lead the winery to the next level.

Level Four: Strategic Human Resources Functions

Strategic HR involves managing the people-activities that will develop the overall organization. Similar to talent management, this level of HR tends to be handled reactively not proactively – if at all. Often senior executives fill this role and may or may not want to dedicate resources or budget to the development of the organization.

Working with an outside, trusted strategic partner in this area of HR could be an excellent use of resources for a winery of any size. Whether you have special projects or are looking for consulting advice and guidance in an ongoing capacity, you can take advantage of a specialist who has helped other wineries with similar issues.

Activities at this level include: development of mission, vision, and strategic objectives, culture analysis and development, key employee retention strategies, change management initiatives, reorganization strategies, and succession planning.

Choosing a partner

Now that you've decided outsourcing might make sense and you've considered which types of activities to do internally and which to hire outside help for, it's time to choose the partner(s) you want to work with.

Some obvious things to look for:

- Cost
- Expertise
- Reputation
- Availability
- Sustainability

Some of the less obvious, but equally important, considerations will be about the consultants' fit with your business. Do they understand (or at least ask about) your business goals, your challenges as an organization, your culture? Does their consulting style correspond with your business style? For example, do you want to work with a "button-down, suit-wearing, big city" consultant or a local company? Which one has the appropriate experience and understands your industry, your employee base, and your competitors?

Managing a successful partnership

Finally, even after you've made a decision and hired a company or consultant, you'll still need to actively manage the partnership. The key is continuous and proactive two-way communication. Together, you will establish clear requirements and specific outcomes and expectations of the partnership. You'll work together to define roles and accountabilities. You will need a process to periodically evaluate results and to hold your partner accountable for those results.

Summary

Human Resources, at its most noble, is about advancing the goals of the organization and creating a competitive advantage through your people – maintaining safe and legal employment practices, attracting and retaining the top talent in the wine industry, developing the skills and competencies of your people, and developing the future leadership of the winery. Outsourcing HR functions can make your entire organization more effective, but it has to be an integral fit with your overall business strategy. ■

Karen Petit is Director of Marketing for The Personnel Perspective. Founded in 1987, The Personnel Perspective is the North Bay's leading Human Resources consulting firm with expertise in compliance, training, and recruitment. She can be reached at 707/576-7653 or karenp@personnelperspective.com.

Rootstock characteristics

As a viticulturist, I am often asked about what rootstock to plant. I respond with a series of questions about the particular site. For example, what is the soil series? What percentage of rock is in the soil profile? What variety is to be planted? What is the climate of the site? All these questions assist me in sorting through rootstock characteristics to find the best match.

When I first came to California in 1980 to work in the foothills, most of the vineyards I worked with were own-rooted, or on AXR-1 and sometimes St. George. When I went to work at Sterling Vineyards in Napa Valley in 1985, Tucker Catlin (VP of production) had already planted several rootstock trials because AXR-1 and St. George were too vigorous for many of the soils in Napa Valley.

The rootstocks planted were SO4 (later identified as 5C), 101-14, and some 3309C. In 1987, we found the first AXR-1 vines dying of phylloxera in a Rutherford vineyard and in conjunction with the University of California, Davis (UCD), began to plant a series of rootstock trials.

In 1992, the American Society for Enology & Viticulture sponsored a Rootstock Symposium that brought together scientists from around the world. At that symposium, Dr. Andy Walker (UC Davis) gave a list of 50-plus rootstocks currently available in California. In a recent conversation with Dr. Walker, he indicated that the list was still valid in 2006, with a few additions developed for nematode resistance.

Popular rootstocks in California

In preparation for this column, I called five California-based nurseries and asked what rootstocks they sold in 2006 and the percentage of sales of each rootstock.

The results are shown in the table below.

There were a few other rootstocks such as 1616C that one nursery sold but it was less than 0.05% of the total. Of the 50-plus rootstocks available, only 14 are being sold by the nurseries that responded to my questions.

In comparison, I looked at the rootstocks that I put into the ground for clients in 2006. Of the 156,000 vines planted, 420A accounted for 66.8%, Riparia 17.4%, 101-14 8.8%, 3309C 6.2%, and 1103P 0.8%.

Rootstock	% of Sales
101-14	39.7
3309C	14.3
1103P	10.9
110R	7.7
420A	5.9
SO4	5.5
St George	3.4
5BB	2.3
Riparia	2.0
5C	0.9
140R	0.9
44-53	0.8
039-16	0.8

For the nursery sales, 101-14 accounts for about 40%, which is almost triple the sales of 3309C. Yet for the vines I planted, 101-14 accounts for less than 10%. What is it about 101-14 that would attract such sales, and if it is so popular why would I not be using more 101-14?

American species used for rootstocks

The rootstocks that are currently being planted were bred in Europe between 1880 and 1920. The exception is 039-16, which is a UCD rootstock bred to control fanleaf virus. The European rootstocks were not bred to control vine size or vine growth rate, but rather for phylloxera resistance.

The primary species used for early rootstock breeding were *Vitis riparia*, *Vitis berlandieri*, and *Vitis rupestris*. *Vitis riparia* was found along a river bank and is tolerant to limestone but, as a grafted plant, it has very low limestone tolerance for reasons that are not yet known. Riparia Gloire and a selection of Vitis riparia root and graft easily, and are early-season rootstocks (Pongracz, 1983).

Early season means that the root system does not support the top growth into the cooler months. Another rootstock that grafts and roots easily and is an early-season choice is 101-14, which will be discussed in more detail below.

Vitis berlandieri was found in the limestone hills of southwest Texas. *Berlandieri* cuttings have difficulty rooting, thus it was bred with easier rooting species such as *riparia*.

Vitis rupestris is found in eroded gravel banks where deep roots are required to access water. *Rupestris* come from Latin, meaning stone. *Rupestris*, like *riparia*, is less limestone-tolerant when grafted.

Common rootstock options

Riparia Gloire was selected in France from *Vitis riparia* cuttings that originated in the U.S. This is a short-season rootstock, with limited limestone and nematode tolerance. Even when planted in deep fertile soils, potassium and phosphorous deficiencies can occur.

The rootstocks 420A, 5C, 5BB, and SO4 are *berlandieri* x *riparia* hybrids. The rootstock 420A is more *berlandieri*-like than *riparia*. 420A is the most late-season rootstock that I have worked with in California. 420A has limited nematode tolerance and has difficulty taking in potassium, so in high-potassium soils such as volcanic ash it can be a good choice.

High potassium can influence juice pH, especially in Syrah. 420A grown in soils with low potassium (less than 150 mg/kg) will show potassium-deficiency leaf symptoms earlier than 101-14 or 3309C. 420A is not a good rootstock choice in soils that would be considered magnesic.

The rootstocks 101-14 and 3309C are *riparia* x *rupestris* hybrids. 101-14 is more *riparia* than *rupestris* while 3309C is more *rupestris* than *riparia*. 101-14 has very good tolerance to rootknot nematodes, and it has a shorter vegetative cycle than 3309C.

In California, I have planted 101-14 with good results in soils with an SAR (sodium adsorption ratio) greater than 6 and less than 12. 3309C has limited nematode resistance, and

does not do well in soils with an SAR greater than 6, which is probably due to the sodium interfering with potassium uptake. 3309C seems to be very sensitive to leaf roll virus expression.

The rootstocks 110R, 1103P, and 140R are *berlandieri* x *rupestris*. Of the three, 140R has the best limestone tolerance and is also the most vigorous. I have seen140R in Italy growing dry-farmed in calcareous soils. These rootstocks have dense, extensive root systems, which impart high vigor to the vine. Both 140R and 1103P are late-season rootstocks similar to 420A.

In my own experience 140R, 110R, and 1103P are too vigorous for the vineyards that I have planted. The only time I use 1103P is in soils with an SAR greater than 12.

The rootstock 44-53M is a *riparia* hybrid (*cordifolia* x *rupestris*). This rootstock grows poorly in limestone due to severe magnesium deficiency. Research in California has shown that this rootstock takes up large amounts of calcium, potassium, and magnesium (Andy Walker). In California, 44-53M is often recommended for magnesic soils because of its ability to uptake potassium. However, compared to 101-14 grown in the same soils, I have seen 44-53M develop severe phosphorous deficiency.

The rootstock 1616C is *solonis* x *riparia*, which has very good nematode resistance. This rootstock does very well in wet clay loam soils, for unknown reasons.

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Summary

- Riparia Gloire is a short-season rootstock with limited limestone and rootknot nematode tolerance. This rootstock can develop nutrient deficiencies even in deep fertile soils.
- 420A is a long-season rootstock with some limestone tolerance. This rootstock has difficulty taking in potassium.
- 101-14 is a short-season rootstock with good rootknot nematode tolerance and the ability to grow in soils with SAR greater than 6 but less than 12.
- 3309C has limited rootknot tolerance and does not grow well in soils with SAR greater than 6, probably due to the sodium interfering in potassium uptake.
- 1103P can grow in soils with SAR greater than 12, but otherwise may be too vigorous for most California soils. 1103P is a long-season rootstock.

There are many questions in my mind about these rootstocks. Why do we see differential nutrient uptake in 420A and 44-53M? Why is 1103P more tolerant of sodium? Why does 1616C have some tolerance to wet feet? How do rootstocks and varieties interact? Are there climate situations where the variety dominates the rootstock in terms of leaf senescence?

From my experience, there is not a linear relationship between rootstocks and vine vigor. But it is commonly accepted that Riparia Gloire is a low vigor rootstock and 140R is a very high vigor rootstock. Therefore, knowledge of rootstock characteristics is not enough information to make a rootstock choice. The characteristics of the site are just as critical.

In the next column, I will discuss what soil chemistry, physical, and biological characteristics are important in rootstock selection. I will also offer some field observations on how weather patterns (rainfall, wind, and temperature) may influence rootstock selection.

Back to my earlier question: Why is 101-14 popular? It roots and grafts well, which any nursery will appreciate. 101-14 also has good nematode resistance.

I choose 420A rather than 101-14 because it is a late-season rootstock that can hold leaves even in a very cool climate. In most of the areas where I plant, high nematode populations are rare. I have found that growing 420A rootings for one season in the vineyard allows for a very high field-graft take (above 95%). This eliminates the issue nurseries have with how poorly 420A roots.

I do not believe in a universal rootstock. Rootstock should be chosen to match specific site characteristics and this will be discussed in detail in the next two columns. ■

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Tipping tanks

Continued from page 104

of at least two cellar workers, and minimizes the need for workers to go into confined spaces of tanks.

The working height of the system, at the catwalk, is usually between five to seven meters. This is not significantly high, especially compared to some systems where tanks are extended into the air above a press. The reduced height adds to the safety factor, and minimizes energy use required to pump the must.

During busy harvest activity, when receiving grapes from many vineyards, having tipping tanks to "allow the rapid intake to storage independent of press availability," is another advantage that Clive Jones, winemaker at Nautilus Estate, notes. He reports reduced fruit maceration using the tanks.

Summary

Besides production efficiency, taste and quality were important factors when considering these tanks. Experiments were done on a small scale before developing large tanks. The tipping tank advantage of effective dejuicing, control of skin contact, and reduced fruit maceration all aid in improving wine quality.

A significant deterrent to installing the tanks, especially for a small winery, is cost. Wayne Taylor (design engineer for Taylors Engineering), estimates that tipping tanks cost 200% to 300% more than conventional stainless steel upright tanks due to the increased tank rigidity, structural framing, and hydraulics. However, Fraser (Montana Brancott) and Woolley (Nobilo) both estimated that the saving in labor and time more than compensates for the additional cost, and thus have additional banks of tanks on the drawing boards.

As one alternative to shoveling must, and accumulating grapes while waiting for a press, tipping tanks have proven to be extremely cost-effective for some New Zealand wineries. ■

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2006 PROGRESS REPORT

California Sustainable Winegrowing Program

BY Ann Thrupp, Managing Director, California Sustainable Winegrowing Alliance

Participation in the California Sustainable Winegrowing Program (SWP) self-assessment workshops has continued to grow, with 33% of the total statewide winegrape acreage and 53% of the total statewide annual wine production having been assessed by growers and wineries.

The SWP provides growers and vintners with information and tools to increase the adoption of sustainable practices statewide. This innovative program is generating enthusiastic and widespread involvement by the wine community, and measuring and demonstrating improvements in vineyard and winery practices throughout California.

Participation in 2006 demonstrates a 24% increase in the total number of enterprises involved in the program since the 2004 report, a 23% increase in vineyard acreage and a 19% increase in wine case production that has been assessed and submitted (as of October 2006.)

Cover crop in vineyard.

Elements of progress covered in this 2006 interim report include:

- Increased and ongoing involvement and support of the California wine community in the self-assessment process, involving 1,165 wineries and vineyards throughout California from the start of assessment activities in 2002 to October 2006.
- Release of a second edition and web-based version of the *Code of Sustainable Winegrowing Practices Self-Assessment Workbook,* which includes an additional chapter on Air Quality. A new, revised web site at www.sustainablewinegrowing.org has an online edition of the workbook where winery or vineyard staff can self-assess their sustainability in 227 types of practices, and receive feedback on their individual results.
- Demonstration of results in Integrated Pest Management through targeted education and reassessment. Winegrowers increased their performance in 31 of 38 pest management criteria by almost 8%. Greater increases appeared for several practices, including: use of reduced-risk pesticides, up 18%; employee training, up 16%; predatory mite releases, up 44%; and weed monitoring, up 22%.
- A growing number of partners to leverage knowledge and resources.

Several unique factors have facilitated progress and success in the Sustainable Winegrowing Program:

1) Involvement of many vintners and growers with multiple partners and stakeholders is a crucial attribute of the program. There has been a tremendous effort to participate by the wine community, and numerous partners have been actively involved and enable continued success.

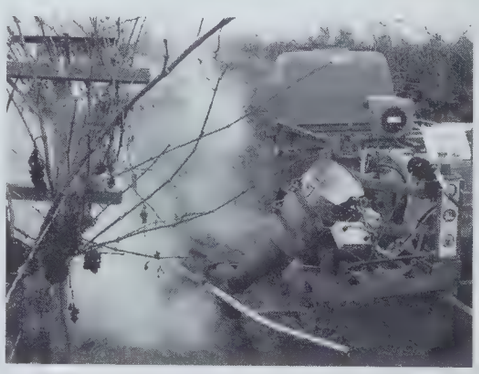
2) SWP is comprehensive in scope, addressing three interlinked goals of Environmental Soundness, Economic Feasibility, and Social Equity, and covering a broad range of elements in the production of grapes and wine — from ground to bottle.

3) SWP uses a systems approach, recognizing the interconnections between soil, water, air, vine health, grape quality, energy, materials, human resources, and many other factors involved with producing quality grapes and wines.

4) SWP builds bridges between agriculture and environmental interests, through partnerships with many stakeholders, cultivating "win-win" approaches and synergies.

5) SWP's innovative system of data tracking and reporting allows monitoring and measurement of participants' results, and improvements over time; and the aggregated results for the wine industry are reported in a transparent way to the partners and the public.

The SWP is providing leadership in the path to sustainability, and that gives the California wine industry a unique



Weed steamer.

Vineyard Self-Assessment Participation (as of October 2006)		
Number of Distinct Vineyard Enterprises	990 enterprises	
Total vineyard acres farmed by 990 enterprises	288,072 acres	55.2% of 522,000 total statewide acres
Number of vineyard acres assessed by 990 Enterprises	171,764 acres	32.9% of 522,000 total statewide acres
Number of vineyard enterprises that submitted assessment results	807 enterprises	81.5% of 990 total enterprises
Total vineyard acres from 990 enterprises assessed and submitted	152,799 acres	29.3% of 522,000 total statewide acres

advantage in the global market. The program is also setting a positive example for other agriculture sectors and crops — and gives everyone strong hope for the future.

The California wine community's growing participation

A prominent feature of the SWP is the active leadership and involvement by growers and vintners throughout all phases of the program — from development through ongoing implementation of the program, and by adoption of sustainable practices in wineries and vineyards.

Overall guidance for the development of the Code of Sustainable Winegrowing Practices was provided by the Sustainable Winegrowing Joint Committee, comprised of 50 individuals including members of the Wine Institute and California Association of Winegrape Growers (CAWG), representing all major winegrowing regions and small, medium, and large vineyard and winery enterprises.

Self-assessment and targeted education workshops

Self-assessment workshops, utilizing the *Code of Sustainable Winegrowing Practices Self-Assessment Workbook*, represent the first phase in the cycle of continual improvement. In the 2004 interim report, the initial goals for self-assessment participation were surpassed during the first round of workshops.

Sheep mowing a cover crop.

Working in collaboration with regional winegrower associations, the SWP has organized 88 educational workshops (since 2004) throughout California, which have reached reached over 5,000 growers and vintners. These workshops target areas in need of improvement, covering topics such as Integrated Pest Management, Water and Air Quality issues, Ecosystem Management, and Energy Efficiency. They enable participants to obtain new information, exchange ideas with colleagues, and develop action plans to implement more sustainable practices.

"As farmers and landowners, we love the land and are ever-mindful of environmental impacts," says Randy Lange, CSWA Chairman and co-founder of Lange Twins Wine Estates (Woodbridge, CA). "Exhausted soils and misuse of the land and water contribute to less productive vineyards. Environmental stewardship comes naturally because it makes sense for our business, our family, and our community."

Wineries that have assessed vineyards are also included in the vineyard assessment numbers. Nearly all wineries grow winegrapes and many also purchase grapes from other sources for use in their wines.

The California Sustainable Winegrowing Alliance acknowledges the support and involvement of the wine community, partners, stakeholders, and funders, including the American Farmland Trust, the California Department of Food & Agriculture, Pacific Gas & Electric, the National Fish & Wildlife Foundation, the U.S. Department of Agriculture Natural Resources Conservation Service, and members of CAWG and the Wine Institute.

Looking to the future, the California wine community remains committed to expanding the Sustainable Winegrowing Program. The goals are to increase the involvement of vineyards and wineries in self-assessments, offer targeted education and action plan workshops statewide, work with research institutions to address knowledge gaps, develop new educational materials, translate educational materials into Spanish, and expand the partnership network.

It is hoped that the efforts of the SWP can serve as an inspiration and model for other agricultural sectors, to increase the adoption of practices that are environmentally sound, socially responsible, and economically feasible. ■

Winery Self-Assessment Participation (as of October 2006)		
Number of Distinct Winery Enterprises	175 facilities	
Total cases produced by 175 enterprises	170.7 million cases	62.5% of 273 million total statewide cases
Number of cases assessed by 175 enterprises	143.8 million cases	52.7% of 273 million total statewide cases
Number of winery enterprises that submitted assessment results	107 facilities	61.1% of 175 total facilities
Total cases from 107 winery enterprises assessed and submitted	114.9 million cases	42% of 273 million total statewide cases

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